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SHEEP DISEASES



BLACK-FACED HIGHLAND SHEEP IN THEIR NATIVE HOME

Courtesy Agricultural Digest.

VETERINARY MEDICINE SERIES

No. 12

Edited by D. M. CAMPBELL

SHEEP DISEASES

BY

E. T. BAKER, D.V.M.

ILLUSTRATED



Chicago

AMERICAN JOURNAL OF VETERINARY MEDICINE

1916

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D. M. CAMPBELL

NO. XXVII
ANNUAL REPORT

PREFACE.

As economical producers of those prime necessities of civilized man, good food and good clothing, sheep are destined to increase in numbers, and sheep raising to speedily attain and maintain a more important place in the animal industry of this country. Moreover, it being also a fact that of all domesticated animals sheep possess the least natural resistance to disease and particularly to parasitism, one may readily appreciate the importance of skilled veterinary service for the welfare of the sheep industry, now after more than a century's existence in this country, only at the threshold of its development.

It is unnecessary to emphasize the need for works dealing authoritatively with disease as it occurs in sheep and its treatment. That need is acutely realized by most veterinary practitioners. It is hoped that this treatise will to a degree meet the requirements of the searcher for practical information on this subject.

The major portion of the contents of this volume has been gathered from the field of experience and is presented solely from the viewpoint of the practitioner. To conserve the health and prevent disease among our flocks is a gigantic task, and one worthy of the highest attainments. To this task, in his limited field, have been devoted the best efforts of the writer, throughout the greater part of his veterinary experience.

Moscow, Idaho.
September, 1916.

E. T. BAKER.



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SECTION I.

HISTORY OF THE BREEDS.

The word sheep is of unknown etymology, and the origin of the animal itself is veiled in obscurity as great. It is supposed that domesticated sheep originated from the wild forms of sheep, the "Mouflon," the "Musimon," and the "Argali."

The sheep is also one of the oldest of all domesticated animals; the different breeds are the results of environment, combined with man's ingenuity. For detailed histories the reader is referred to the various excellent texts on sheep management¹; space permits us to give only the briefest mention of the development of the sheep industry in this country.

No domesticated sheep were found in North America by the early explorers, and the wild Rocky Mountain sheep has never been tamed nor crossed with domesticated breeds.

For centuries, Spain controlled the fine-wool sheep of the world, and no exportations were allowed to other countries, until in 1765, when three hundred Spanish sheep were introduced into Saxony by royal favor, and became the foundation stock of the Saxony Merinos. In 1783, the French government imported Spanish sheep and

¹Those consulted were:

Craig's "Sheep Farming."

Wing's "Sheep Farming in America."

Kleinheinz's "Sheep Management."

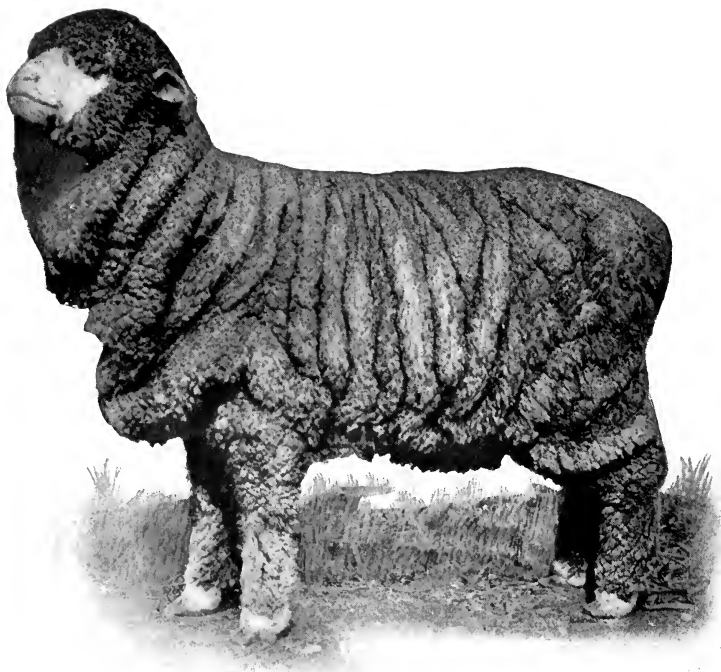
established them on a farm near Paris, called Rambouillet, progenitors of the breed of that name.



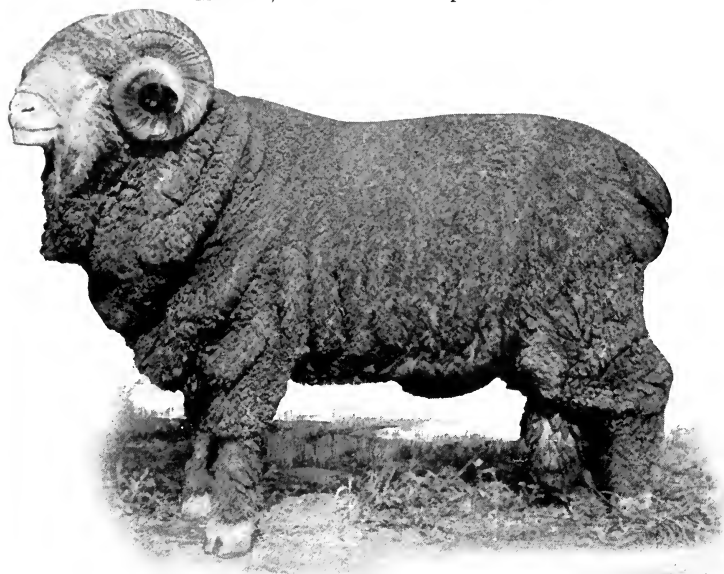
MUSIMON OF EUROPE.

Courtesy American Sheep Breeder.

During the first quarter of the nineteenth century Merinos were introduced into the United States. In 1801, the wool industry, that has made that state the leader of fine-wool sheep, was started in Ohio. The same year a number of Rambouillets were sent to New York by Robert Livingstone, our minister to France. In 1802, General



MERINO, TYPE A—Champion Ewe.



MERINO, TYPE B—Champion Ram.

Humphries, our minister to Spain, sent to his native state, Connecticut, nearly one hundred head of pure-bred Merinos. In 1809, William Jarvis, our minister to Portugal, sent four thousand pure-bred Merinos to Vermont. The next two years, it is estimated, nearly twenty thousand sheep were brought to this country and the industry thus started on foundation stock of the best blood.

Due to the low altitude and moist climate of England, the Merino breeds have never done well



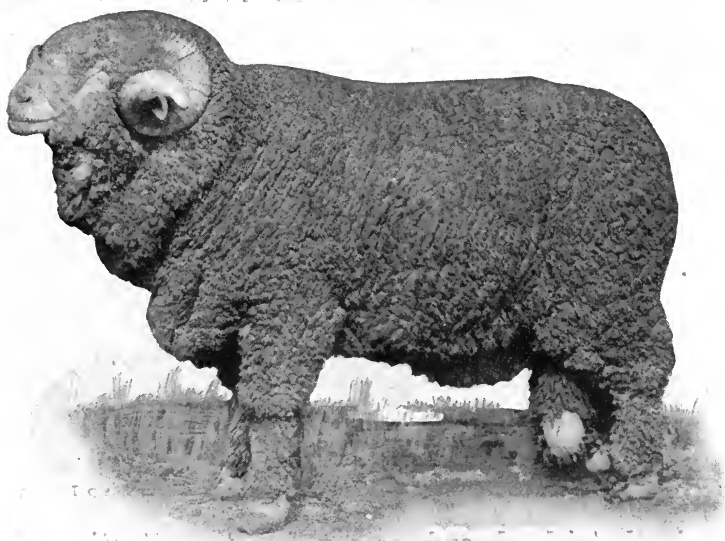
AFRICAN SHEEP.

Courtesy American Sheep Breeder.

in that island, and, as a result, the attention of breeders, particularly of Robert Bakewell, was early given to improving the mutton qualities of their sheep. All of our breeds of medium and long-wool sheep, chiefly of the mutton types, have originated from strains long bred in England for their mutton producing qualities.

In all countries of the world the sheep industry

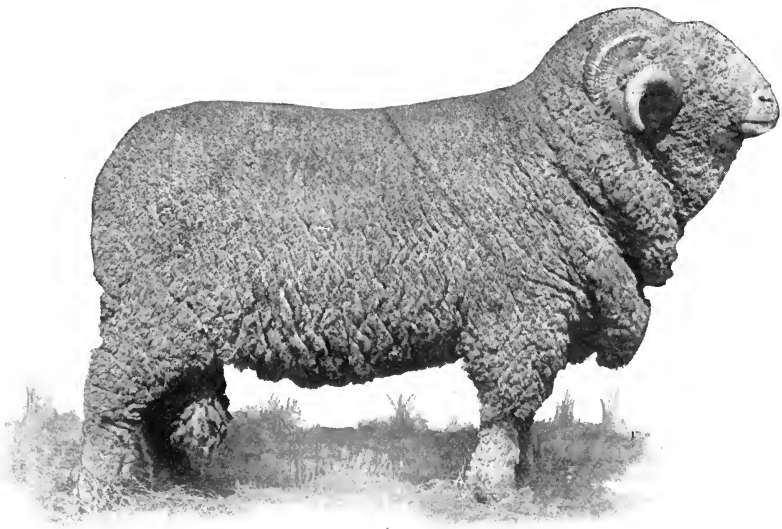
has flourished and has produced untold wealth for the owners. While it is a far cry from the times of Abel and Abraham, and the shepherds with their little flocks on the Chaldean hills in Biblical story, to the present day of gigantic sheep ranches of Australia, Argentine and the United States, the habits of this docile animal have remained practically the same as they were at the dawn of civilization.



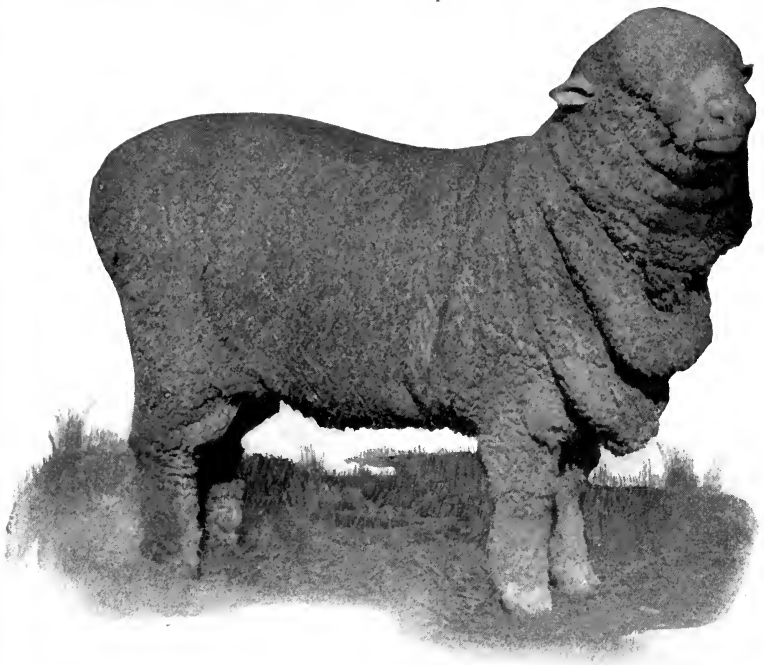
MERINO, TYPE C—Champion Ram.

In round numbers, there are about six hundred million sheep in the world, divided as follows:

60,000,000 head in North America, the United States, Mexico and Canada leading in order named.



RAMBOUILLET—Champion Ram.



RAMBOUILLET—Champion Ewe.



120,000,000 in South America, the great majority being found in Argentine, Uruguay and Chile.

130,000,000 in Europe, the leading sheep raising countries being European Russia, Great Britain, European Turkey, France, Spain and Austria-Hungary.

115,000,000 in Asia, Asiatic Turkey, Asiatic Russia and India leading.

60,000,000 in Africa, South Africa and Algeria producing nearly two-thirds of the total.



ARGALI.

Courtesy American Sheep Breeder.

115,000,000 in Asia, Asiatic Turkey, Asiatic Russia and India leading.

60,000,000 in Africa, South Africa and Algeria producing nearly two-thirds of the total.

115,000,000 in Oceania, Australia and New Zealand leading.

The three foremost sheep producing countries in order named are Australia, Argentine and the United States.

In these days of inventions and improvements, no substitute for wool has ever yet been devised. The sheep remains the only machine that can transform the forage from deserts and forests into fleecy wool and delicious mutton, and it will thrive where other animals starve to death. Its chief disadvantage is its very feeble resistance to parasites and diseases, the prevention of which is the greatest task of the shepherd.

The classification of the breeds according to the fineness of the wool-fibre seems to be the common custom, the three classes being:

1. The fine-wool.
2. The medium-wool.
3. The long-wool.

A convenient table is as follows:

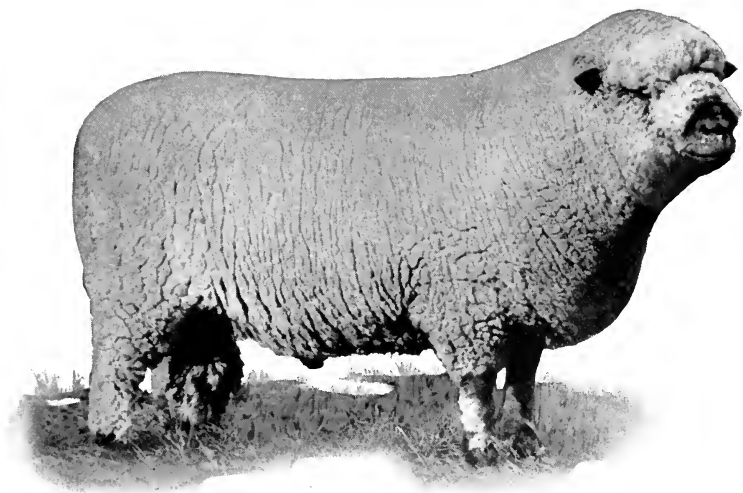
FINE	LIGHT-FACED
Merino	Merino
MEDIUM	Cotswold
Shropshire	Dorset
Southdown	Leicester
Oxford	Lincoln
Hampshire	Cheviot
Cheviot	DARK-FACED
Dorset	Shropshire
Suffolk	Southdown
LONG	Hampshire
Leicester	Oxford
Lincoln	Suffolk
Cotswold	

In this country, the Merino blood, crossed with medium and long-wool rams, has been extensively used.

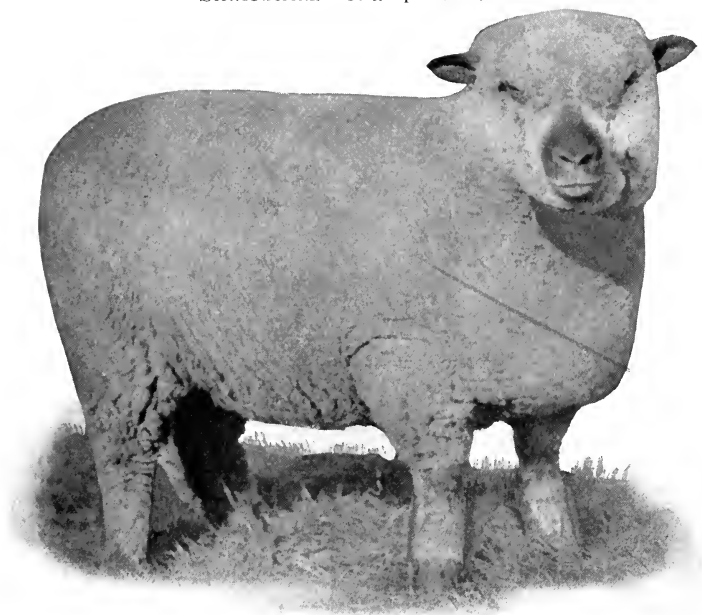
I. THE FINE-WOOLS.

Merino.

This well-known breed seems to have been known in Spain since the earliest records. It is supposed they were brought to Spain from Italy, where they had been taken by a band of Grecians to the city of Tarentum. From the eighth to the thirteenth centuries under the regime of the Saracens and Moors, the wool industry flourished in Spain. As previously stated, no exportations were made from Spain until 1765, when the Elector of Saxony secured three hundred Merinos and bred



SHROPSHIRE—Champion Ram.

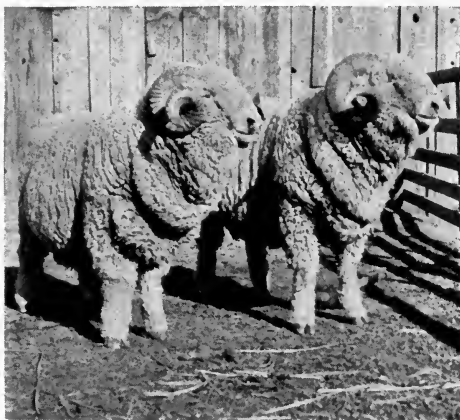


SHROPSHIRE—Champion Ewe.

them so carefully that they constitute a famous branch of the Merino, called the Saxony Merinos.

In 1783, France imported a large number of Spanish Merinos and placed them at Rambouillet, near Paris, and there created the breed known as Rambouillets. Von Homeyer, of Pomerania, Germany, improved this type so much, that a special breed known as the Von Homeyer Rambouillets is in existence. This type was brought to Ohio in 1851, and has since flourished.

Many other types of the Merino have been devel-



RANGE RAMBOUILLETS.

oped in this country, among them being the Standard Delaines, National Delaines, Improved Delaines, Dickinson Delaines, and Black-top Spanish Merinos.

At the present time it is customary to divide the Merino into three classes:

Class A: The extreme wool production type. The entire body is covered with folds and wrinkles, and there is an abundance of yolk in the fleece.

Class B: The body is not so wrinkled, which makes the shearing easier. It is the commercial type for wool production. This does not include the Rambouillet.

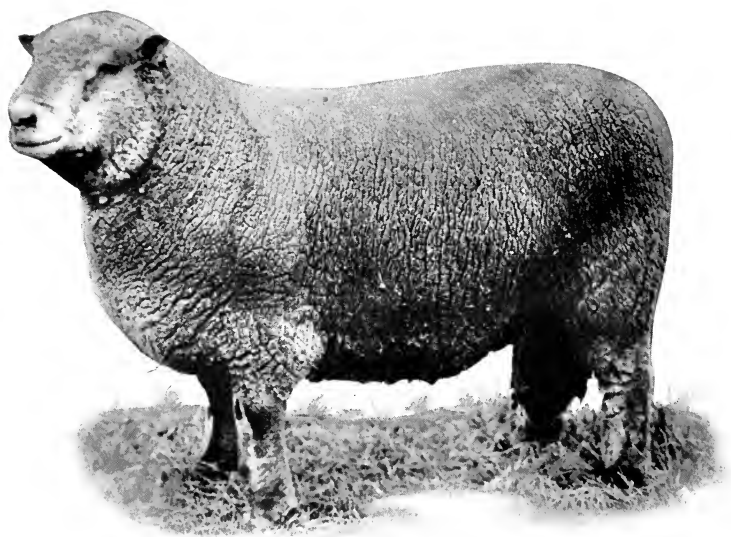


TYPICAL WESTERN SHEEP OWNER'S HOME TWENTY YEARS AGO.



HOMES LIKE THIS ARE THE RULE AMONG THE SHEEP MEN NOW.

Class C: This type has a longer fibre and the skin is nearly free from folds. These are better



TYPICAL SOUTHDOWN RAM.



TYPICAL SOUTHDOWN EWE.

mutton producers than the two above-mentioned types. It includes the Delaine Merino.

The Rambouillet.

The Rambouillet is smooth-bodied, except for a few wrinkles on the neck. The rams have large, spiral-shaped horns, while the ewes are hornless. This breed is larger and more growthy than the Merino, but its wool is not so fine.



THE BELL WETHER.

II. THE MEDIUM-WOOLS.

Shropshire.

This breed was first recognized in the early fifties of the last century, and was brought to perfection in the central counties of England. It is one of the most popular of all western range sheep, the "Shrops" being a general-purpose breed.

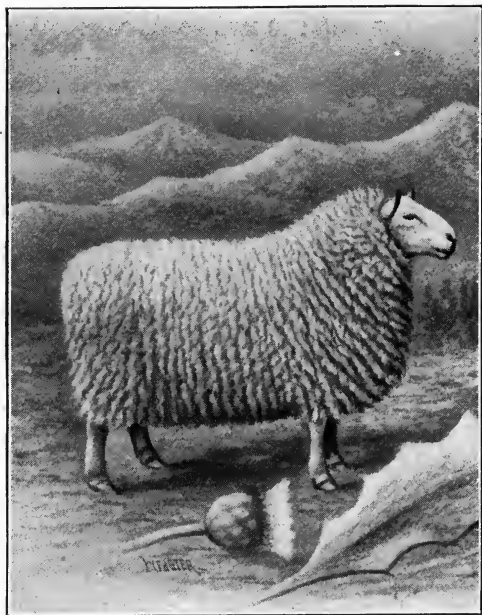
Quick to mature, hardy, good mothers, prolific breeders, easy feeders and good rustlers, they have attained their position by their sterling qualities.

They are medium in size, and cross well with other breeds. They are dark-faced.

The first Shropshires were brought to this country in 1833. They were taken to Ohio.

Southdown.

This is also a dark-faced, medium-wool breed.

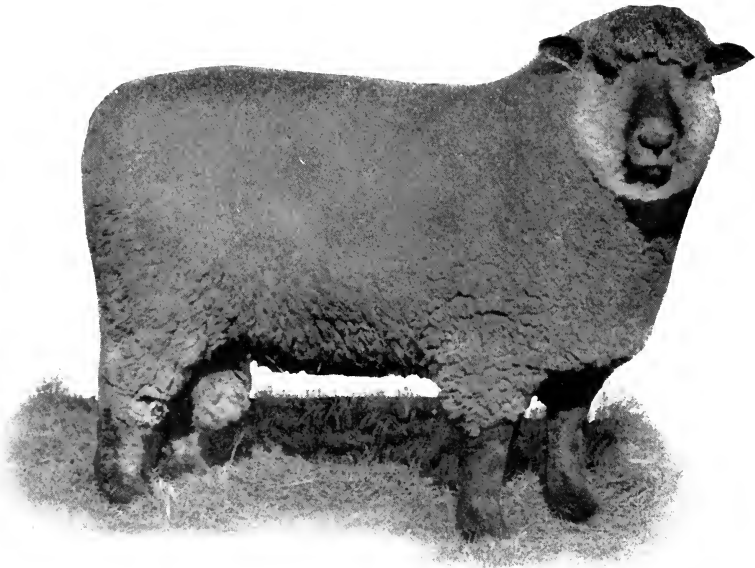


CHEVIOT.

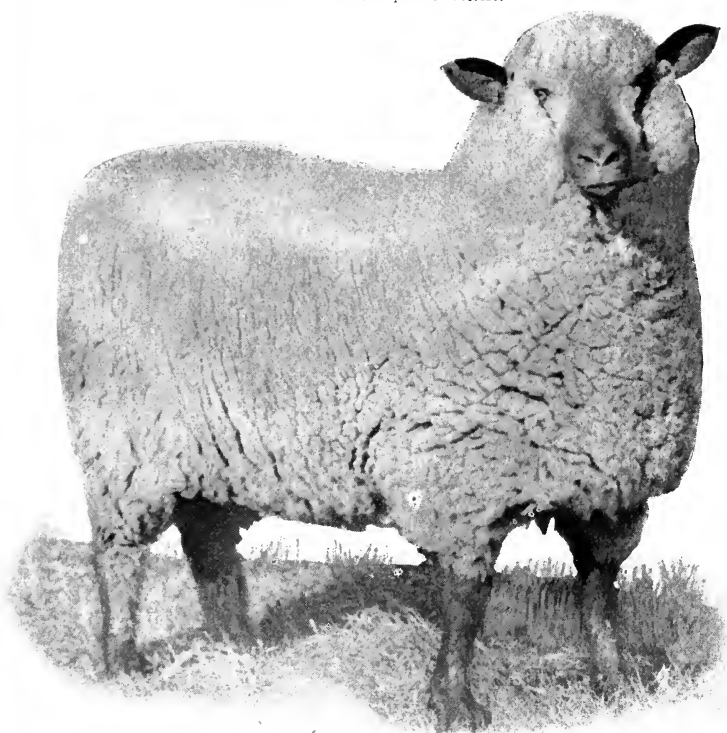
Courtesy Dotshome Farms.

It is perhaps the oldest of the British types, its history dating back for many centuries.

They are noted for their low, compact bodies, with small bone, and excellent wool. As a mutton sheep they are unexcelled.



OXFORD—Champion Ram.



OXFORD—Champion Ewe.

Some claim specimens of this breed were brought with the Pilgrims, and that as early as 1688 they were found in Virginia. In 1803 a small flock was imported into New York, and in 1824 to 1825 many more were imported.

Oxford.

The Oxford originated from crossing Cotswold rams on Southdown and Hampshire ewes. This was begun in about 1830, and in 1861 they were recognized as a distinct breed.



CHEVIOT—Ram and Ewe.

They are very large and mature quickly. They yield the heaviest fleece of any of the Down breeds, fifteen pounds being a common average. It is an excellent small-band sheep, consuming large quantities of food and making good gains. As a forag-

ing sheep it is inferior to the Shropshire. It is dark-faced.



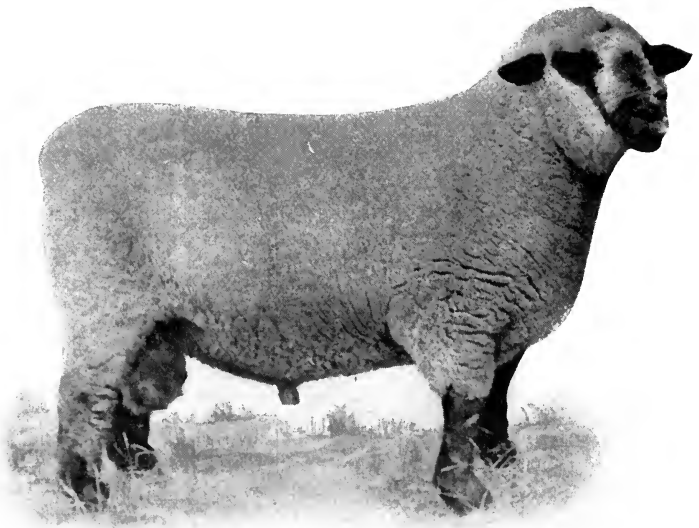
DORSET—Valley View Farm, Wasco, Ill.

Hampshire.

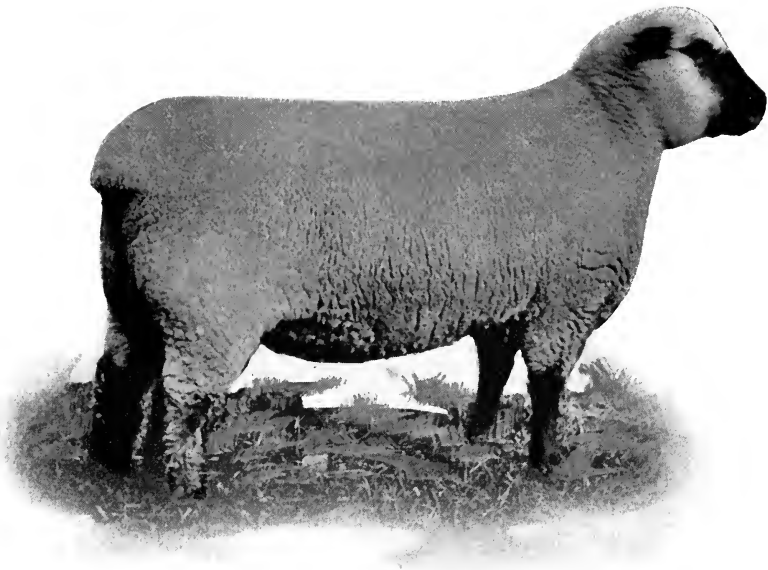
This breed was evolved from sheep raised in Hampshire and Wiltshire, England, crossed with



A TYPICAL RANGE SHEEP.



TYPICAL HAMPSHIRE RAM.



TYPICAL HAMPSHIRE EWE.

Southdown rams. Some claim Cotswolds also were used in the cross. The breed is over one hundred years old, and is a very popular one



ON THE WESTERN RANGE.

where food is abundant. It makes larger gains than any other Down breed during the first part of its life.

The wool is not heavy. The ewe is very prolific, and the lambs of such quick growth that they



A FEW OF A BAND OF 3,000.

make an excellent "hot-house" variety for early markets.

Cheviot.

The Cheviot acquires its name from the Cheviot Hills on the boundary between England and Scot-

land. This breed is as old as the earliest records. They are great foragers, resembling the Shrop-

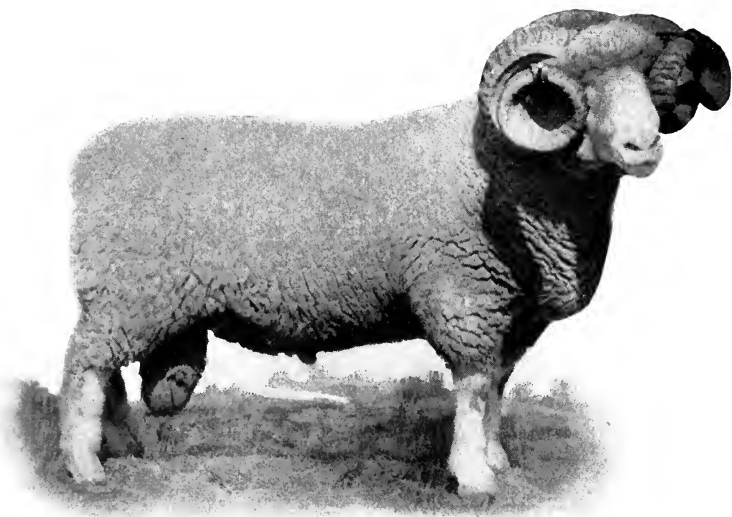


THE SHEPHERD'S ASSISTANT.
The well trained sheep dog, with almost human intelligence, is indispensable.

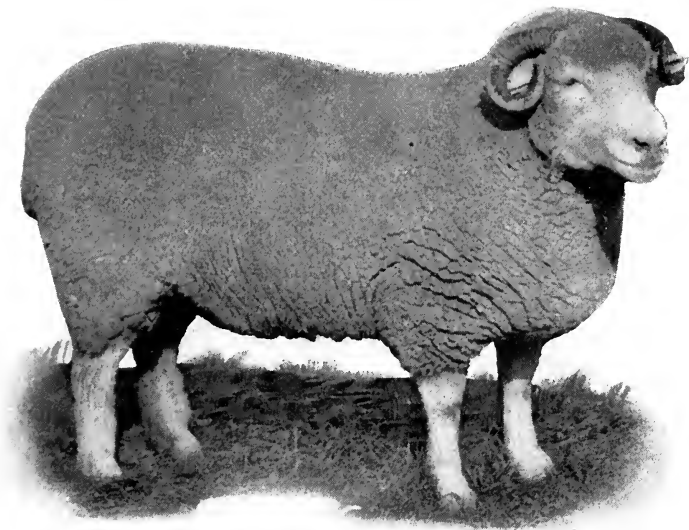
shire in this respect. On account of the strife and "Border Wars" resulting from the frequent disagreements between English and Scottish



WESTERN SHEEP DOG.



DORSET—Champion Ram.



DORSET—Champion Ewe.

chiefs, the breed was not improved for centuries. With long bodies, they were adapted for mountain ranging, and were known as the "long sheep." Crossing has given them better conformation. They are excellent wool and mutton producers, good foragers, and are gaining in popularity. Their beauty and alert activity have contributed not a little in this.

Dorset.

This breed is white-faced; it is peculiar in that both ram and ewe have horns. The Dorsets seem to have sprung from a breed common in the southern and central parts of England since the earliest times. The county of Dorset was especially famed for this kind of sheep, hence the name. About 1862 they were recognized as a distinct breed.

Their great prolificacy renders the Dorset valuable for intensive farming; two lambings a year, and frequently twins, is the record. If only one crop of lambs is raised, the Dorset ewe will come in season very early, and produce lambs for the "hot-house" trade.

Suffolk.

The progenitors of this breed were known as the Norfolks, and thrived in southeastern England. They were hardy and good rangers. Along in the early part of the last century they were improved by crossing with the Southdowns; in 1859 they were recognized as a distinct breed.

This animal is somewhat smaller than a Hampshire but larger than a Shropshire. The lambs are usually black. They are not well known in this country.

III. THE LONG-WOOLS.

Leicester.

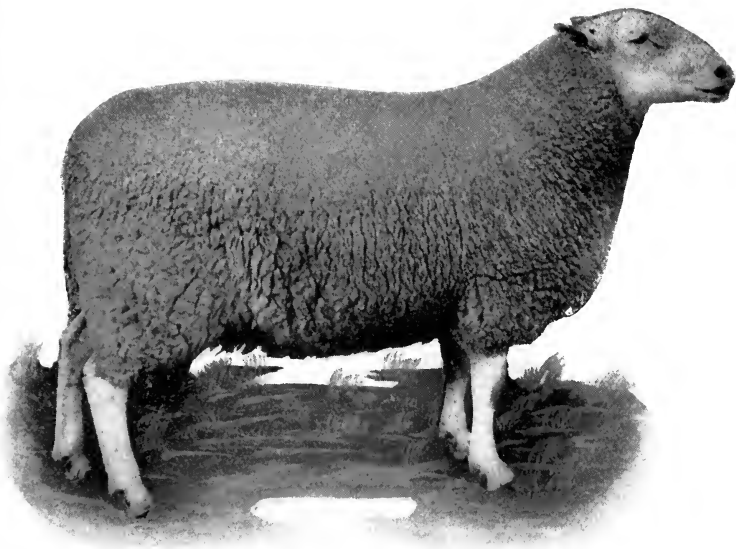
About 1755 Robert Bakewell, the famous agricultural genius of England, began to mate well



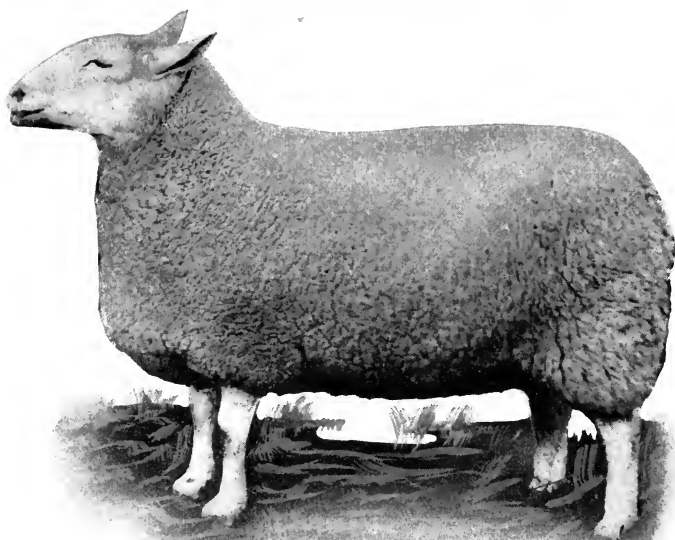
KARAKUL—A Fur-bearing Sheep.

formed sheep found in Leicester county. Soon he had made a notable improvement, and a new breed came into being, known as the Leicester (pronounced leé-ter).

The body is excellent in shape and smoothness, but the lightness of wool on the belly and



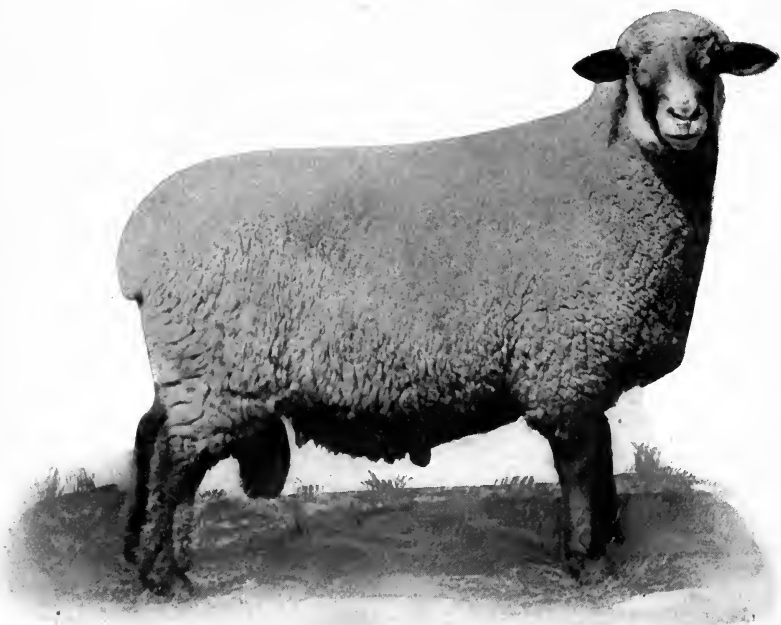
LEICESTER—Ram.



LEICESTER—Ewe.

length of legs gives it a somewhat "leggy" appearance. The original animal, as Bakewell bred it, was not hardy, since he sacrificed constitution and stamina for shapely type.

Their excellence consists in fattening quickly where food is abundant. For this reason the Leicester ram is often used for crossing on other breeds where early fat lambs are desired.



TYPICAL TUNIS RAM.

The Border Leicester was originated by Cully, who secured Leicester rams from Bakewell and crossed them on an old long wool breed, called the Teeswaters. The head of the Border Leicester is free from wool, while the Leicester has a tuft.

Cotswold.

The Cotswold is said to have originated from two words: "Cotes," referring to the barn in which the sheep are kept, and "wold," to an open, rolling upland range. The early history of this breed is veiled in obscurity, although it is claimed they were found in England when Caesar visited the island.

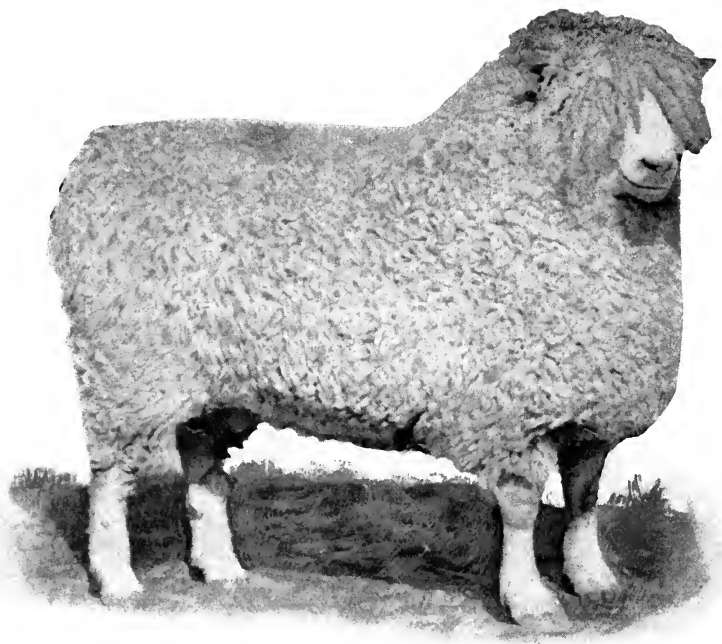
Some authorities claim the present breed is the result of crossing the original Cotswold with Bakewell's improved Leicesters. This cross reduced the size, increased the mutton quality, and lessened the resistance to disease.

The Cotswold is a large, massive appearing sheep, with long wool, fine in fibre. A valuable feature of this breed is its prepotency. In crossing with other breeds it unfailingly transmits its tendency to increase the size and the weight of the fleece. It is a valuable breed for intensive farming.

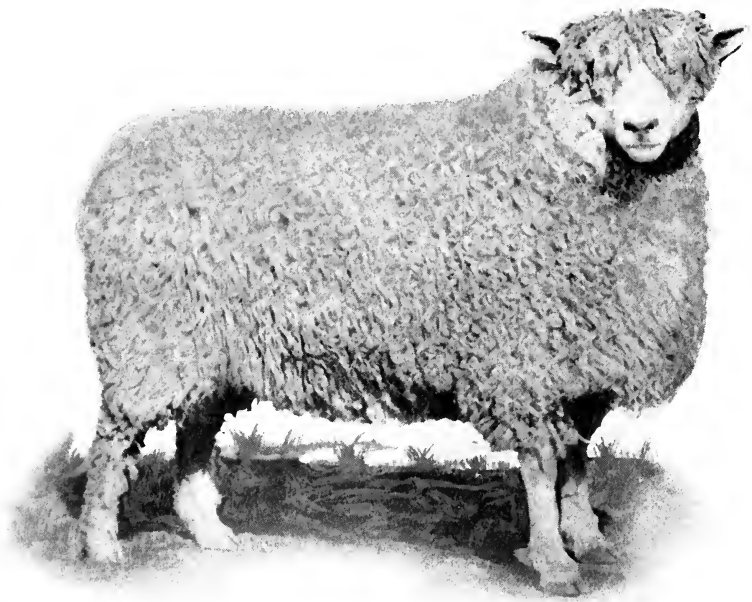
Lincoln.

This is another ancient breed, improved to their present high standard by crossing with the Leicesters. The original breed was found in Lincolnshire, England, hence the present name. In 1862 they were recognized as a distinct breed, and have been extensively imported to the United States and Canada.

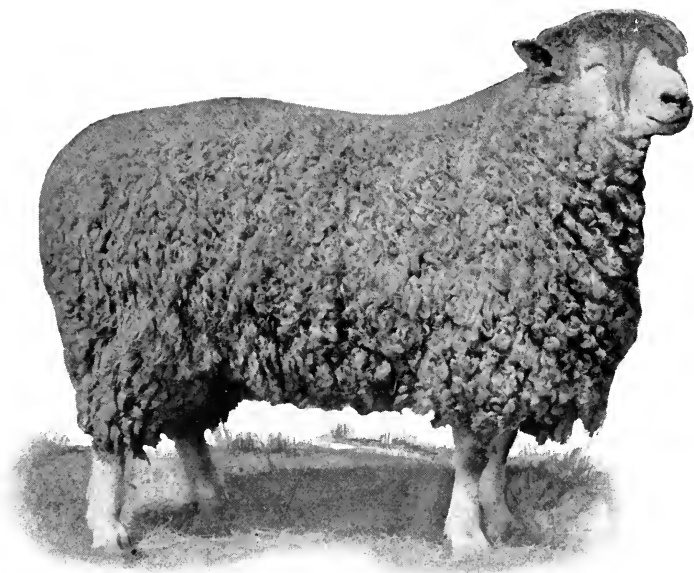
This is the largest breed of sheep, being massive, strong boned, and yielding heavy fleeces. They are extremely popular in crossing on Merino ewes; the progeny have a fine, large, lustrous fleece.



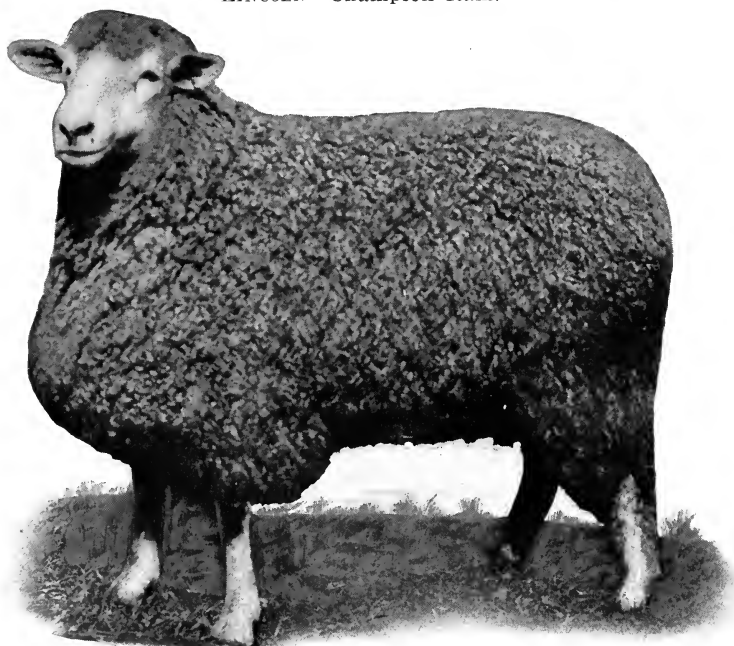
COTSWOLD—Champion Ram.



COTSWOLD—Champion Ewe.



LINCOLN—Champion Ram.



LINCOLN—Champion Ewe.

In the West, they are valuable small ranch sheep, giving great returns in wool, mutton and lambs.

LESSER KNOWN BREEDS.

Romney or Kent.

This breed originated in southeastern England, and some splendid specimens are found in this country. Their chief use on the range is to cross on the Merino. They are white-faced.

Corriedale.

These sheep were recognized as a distinct breed in New Zealand about 1911. They originated from crossing Lincoln rams on Merino ewes. They are highly thought of as wool and mutton producers, especially for the frozen meat trade. They are becoming more extensively raised in the United States, several fine bands being found in the West.

Karakul.

Karakul sheep in small numbers have been imported into the United States. This is a fur-bearing animal, a native of Bokhara, a Russian dependency, and, due to the laws of this little country, forbidding any exportations of sheep, are little known outside of their native heath. They have been crossed with various other breeds, such as Merinos, the progeny being called "Karakul Finewools," and with Persians, the cross being known as "Karakul Persians." The latter cross produces very fine skins.

The Black-Faced Highland.

This breed is an inhabitant of the Cheviot Hills, and is also known as the Black-faced Heath. It is of the long-wool type. (See frontispiece.)

Tunis.

The foundation stock for this breed was imported from Africa over a century ago, but the Civil War almost destroyed it. The distinguishing mark is an exceedingly long, fat tail, and the hornless head covered with tawny, brown hair.

Persian.

Persian sheep were introduced to this country some years ago. When crossed with Merinos they have done well in the arid regions of the west.

CROSS-BRED SHEEP.

Cross-bred sheep are commonly raised by range men who desire a hardy animal, combining the qualities of several breeds. The commonest crosses are the long-wools, such as the Lincoln and Cotswold, on the Merino. Other well known crosses are the Shropshire and Hampshire on the Merino. Due to different range conditions, a cross successful in some part of the country may prove valueless in another. Arguments about the "best breed" or the "best cross" are but a waste of time; the desideratum being ultimate profit.

SECTION II.

ANATOMY.

The anatomy of the sheep greatly resembles that of the ox in general. A brief summary is as follows:²

THE SKELETON.

Vertebrae.

The vertebrae are forty-nine to fifty-one in number: seven cervical; thirteen thoracic; six lumbar; five sacral (fused into one bone), and eighteen to twenty coccygeal.

Ribs and Sternum.

There are normally thirteen pairs of ribs; eight pairs of sternal, and five pairs asternal.

The sternum consists of seven sternebrae; the cariniform cartilage being absent.

The thorax is relatively short and wide.

Cranium and Face.

The occipital is very strong and thick.

The sphenoid is very short.

The ethmoid rather extensive.

The interparietals small.

The parietals form part of the temporal fossae.

The frontals form nearly one-half the length of the skull.

²Sisson's "The Anatomy of the Domestic Animals" was consulted.

The temporals, divided into the squamous and petrous parts, which fuse at birth, form protective coverings for the auditory canal.

The maxilla is short and broad.

The premaxilla is thin and flattened.

The palatine bone is relatively large.

The pterygoid bone is comparatively large.

The nasal bones are short, the size depending on the breed.

The lacrimal bone is large.

The malar bone is relatively large.

The turbinals are very fragile.

The vomer is wide, its size depending on the breed.

The mandible or inferior maxilla does not completely fuse during life.

The hyoid is very short.

The skull, as a whole, is very powerful and well protects the head. The sheep's chief weapon of defense is butting, and its head has been developed to withstand extraordinary concussion.

Thoracic or Front Limb.

The bones of the front limb are small but powerful, and consist of the following:

The scapula is nearly triangular in shape.

The humerus is short, and has a very small deltoid tuberosity.

The radius is short and relatively broad.

The ulna extends nearly the whole length of the radius.

The carpus consists of six bones, four in the upper row and two in the lower.

The metacarpus consists of the large metacarpal and a small metacarpal.

The digits are four in number, only two are fully developed. They have three phalanges and three sesamoids each.

Pelvic Limb.

The ilia are almost parallel.

The ischium is relatively large. The acetabulum is very small, and the pelvic inlet is rather elliptical and oblique.

The femur is comparatively small and cylindrical.

The tibia is short and curved.

The fibula consists of the two extremities connected by a structure resembling a cord.

The patella is rather long and narrow.

The tarsus consists of five bones, several being fused together.

The large metatarsus is longer than the corresponding metacarpus; the small metatarsus being a quadrilateral disc.

The phalanges and sesamoids are almost identical with those of the front limb.

Joints and Ligaments.

The temporo-mandibular articulations permit of the extensive lateral movements of rumination.

The ligamentum nuchae is well developed.

The articulations of the thorax are immovable.

The shoulder joint has an acute articular angle.

In the elbow joint no movement occurs between the radius and ulna.

The carpal joints are very free.

The metacarpo-phalangeal joints are two for each digit.

The sacro-iliac joint is very strong.

The hip joint is well protected by a marginal cartilage which reinforces the shallow acetabulum.

In the stifle joint the synovial sacs communicate so freely as to form a common joint cavity.

The tibio-fibular joint is a complete arthrosis.

The hock joint has very little mobility.

Adapted as the sheep is for mountain climbing, its joints are very strong, and dislocations are rare.

THE MUSCULAR SYSTEM.

The panniculus is well developed.

The masseter is not large but is well developed.

The hyoid muscles are very strong.

The diaphragm is appreciably more oblique than in the ox, and relatively wide.

The muscles of the shoulder girdle, shoulder, arm, forearm, abdomen, pelvis and pelvic limb are similar to those of other animals.

There are four extensors of the leg and foot.

Sprains of muscles, even on the roughest of ground, with much jumping, rarely occur in sheep.

THE DIGESTIVE SYSTEM.

The lips are thin, and the upper one marked by a distinct cleft.

The hard palate is smooth, and the mucous membrane more or less pigmented.

The cheeks are lined with large papillae.

The tongue has a smooth tip.

The milk teeth number twenty.

There are thirty-two permanent teeth: eight incisors in the lower jaw; none in the upper; six molars in each arcade, or twelve in the lower and twelve in the upper jaw. The cement is usually black. The following table gives the eruption periods of the various teeth:

Teeth	Temporary	Permanent
Central incisors	At birth	1 year
Second "	1st or 2d week	2 "
Third "	2d or 3d "	3 "
Corner "	3d or 4th "	4 "
First molar	4th week	1½ to 2 years
Second "	"	"
Third "	"	"
Fourth "		3 to 5 months
Fifth "		9 to 12 "
Sixth "		1 to 2 years

When the lamb is about a year old, the central pair of milk teeth drop out, succeeded by a pair of permanent teeth.

About two years of age, the second pair of milk teeth (on each side of the centrals) drop out, and permanent teeth take their place.

A year later, the third pair of milk teeth are "shed" and the permanent teeth have appeared in their place.

At about four years of age, all the milk teeth have vanished and the sheep has a "full mouth."

Forced feeding and fattening cause the teeth to shed earlier; some show sheep having lost several of their permanent teeth before the age of five years. However, as a rule, the seven-year-old has lost one or two, and has a "broken mouth"; but one cannot tell the age of sheep with certainty, by the teeth.

The salivary glands are well formed and the parotid ducts open opposite the third molar.

The tonsil is bean-shaped and about one-half inch long.

The pharynx has a median fold which is a continuation of the nasal septum.

The esophagus has a lumen of about one inch when moderately distended.

The four compartments of the stomach—the rumen, reticulum, omasum and abomasum—have a total capacity of about four gallons. The omasum is very small, having a capacity of only a pint. The abomasum is larger, holding nearly two quarts.

The small intestines are about eighty feet long, and the lumen is about one inch in diameter.

The cecum is about a foot long, and of a capacity of nearly a quart.

The colon is about fifteen feet long, its lumen ranging from one inch to two inches.

The liver weighs about one and one-half pounds, and lies mainly on the right of the median line.

The bile duct joins the pancreatic duct and opens into the duodenum about a foot posterior to the stomach.

The spleen is triangular in shape, weighing about three ounces.

THE RESPIRATORY SYSTEM.

The nostrils are small and not very dilatable.

The nasal cavity is very short and narrow behind.

The larynx is small and compact.

The trachea is small, and anyone who has attempted to inject gasoline into it will concur in the statement that it is very mobile.

The thoracic cavity is small, and the pleura thick.

The lungs are very unequal in size, the right one being the larger. The left one has three lobes, and the right has four or five.

The thyroid is very extensive, being largely utilized in the manufacture of a biological product.

The thymus is very pale and delicate.

THE URINARY ORGANS.

The kidneys weigh about four ounces, and are bean-shaped. The right kidney lies under the first three lumbar vertebrae, while the left one is usually further forward. In the adult sheep, when the rumen becomes distended with food, the left kidney is pushed back several inches.

The ureter of the left kidney has a peculiar course, due to the movable position of the kidney. It curves upward and inward, and crossing the median plane, runs backward on the left side. The right ureter runs back in a relatively straight line.

The bladder is long and narrow, and extends rather far forward on the abdominal floor.

The adrenals are bean-shaped. The right one lies along the inner border of the kidney and is about an inch long and wide. The left one is somewhat longer and slightly bent in shape. It lies across the left renal vein, and is not in contact with the kidney.

THE MALE GENITAL ORGANS.

The scrotum is long, pendulous and has a distinct neck.

The testicles are very large and oval.

The epididymis is very adherent to the testicle.

The spermatic cord is long, and the vaginal ring small.

The vas deferens is of small calibre.

The vesiculæ seminales are compact.

The prostate is light yellow in color.

The penis is cylindrical, with a urethral process extending out from the glans.

The prepuce is long and narrow.

The urethra lies in a groove on the lower surface of the penis, forming a twisted process. Its diameter is not over one-sixteenth of an inch. This is one reason why mangels or sugar beets are a dangerous food for rams and wethers, on account of the calculi they form.

THE FEMALE GENITAL ORGANS.

The ovaries are small.

The fallopian tubes are long and tortuous.

The uterus lies almost entirely in the abdominal cavity, a thing that should be remembered in diagnosing pregnancy.

The vagina is short, with a thick wall.

The urethra is very short, and dilatable. This prevents serious consequences from urinary calculi in ewes.

The mammary glands are relatively large, and pigmented.

THE CIRCULATORY SYSTEM.

The average sheep has about one gallon of blood; lambs scarcely a pint. This makes it an easy prey to blood sucking parasites.

The pericardium is usually buried in a mass of fat.

The heart is relatively large and situated principally upon the left of the median plane, being opposite the third to the fifth ribs.

The arterial and venous systems are similar to those of other animals.

The lymph system is very well marked in the sheep.

THE NERVOUS SYSTEM.

The diseases of the nervous system are many and varied in the sheep, but as practically all pathological lesions are caused by parasites, not much can be done, except to perform a very careful autopsy.

The spinal cord is long and small, and the brain is relatively small. The nervous system is similar to that of other animals; perhaps not so highly developed as in the horse and dog.

THE ORGANS OF THE SPECIAL SENSES.

The eye is round, and the lids rather thick. The vitreous body is not very fluid.

The ear inclines outward and upward, differing in the several breeds. The auditory canal is small.

The skin is thin and of a pinkish hue when the animal is in good health, and covered with wool. The caliber of the wool fiber varies from one five-

thousandth of an inch in Merinos to one four-hundred-fiftieth of an inch in Cotswolds.

The olfactory organs are well developed; the ewe depends upon the sense of smell to identify her young.

The sense of taste is highly developed; no animal has a more dainty taste than has the sheep, still it will eat poisonous plants, such as death camas, when it is young and succulent, and the animal is very hungry for green food.

SECTION III.

HYGIENE.

All of those methods by which sheep are shielded to a greater or less extent from disease; kept in a state of health, and which contribute to their thrift, may correctly be classed as hygiene.

No animal has less resistance to disease when once infected than has the sheep. No animal repays hygienic care and surroundings with greater profit than this one.



A WESTERN SHEARING CAMP.
About 1200 are Sheared a Day in
This Small Camp.

For detailed information as to the management of sheep, the reader is referred to various books devoted to this subject. The following discussion is designed merely to outline the management and care that is conducive to health.

GENERAL CARE.

The care of fifty sheep on a small eastern farm is a vastly different undertaking from watching over a band of many thousand on the western range. While the habits of the animal are the same, whether it be in a bunch of a dozen or a



TYPICAL SHEARING PENS

band of three thousand, the management must vary to meet existing conditions. For that reason, the carefully formulated rules that may suit one breeder's fancy will be utterly out of place or wholly impractical for another.

In all cases, however, kindness, cleanliness, liberal and regular feeding, together with a natural

aptitude for caring for sheep are essentials for success.

The pulse rate of sheep varies considerably, although seventy to ninety beats a minute may be taken as an average. Respirations vary from twelve to twenty a minute when the animal is per-



IN THE RANGE COUNTRY.

fectly at ease. The temperature is usually around 103 degrees Fahrenheit, taken per rectum, although this depends to some extent on the age, weather, and degree of fatness.

No other animal so clearly exhibits the symptoms of disease as does the sheep. The loss of appetite; the listless air; the dull eye; the drawn-

up appearance of the abdomen, and the seeking of a lonely spot in which to lie down, clearly point out the invasion of some disorder. Other symptoms, more or less marked, give us a clue to the actual trouble, although in many cases where there is no history to guide one, the diagnosis must be made largely by exclusion, or from a postmortem examination of some animal similarly affected.

Handling.

Catching a sheep for examination is often performed incorrectly or carelessly. Grabbing a sheep by the wool often causes a bruise that may persist for months. Nothing else makes quite so unfavorable an impression upon the experienced sheep man as lunging wildly at an animal, and going through unnecessary antics in attempting to catch it.

As strangers frighten sheep, it is a better plan to have the one accustomed to taking care of the flock catch the animal desired. If this is not possible, drive the sheep into a small enclosure and grasp the flank, just over the stifle.

To set it on its rump, place the left arm around the sheep's neck and hold the right forearm of the animal with the left hand. With the right hand reach under and grasp the right hind leg above the hock. Pulling it against one's breast and exerting a little traction on the hind legs, the sheep will be raised on its rump easily, and rendered powerless to struggle.

Leading a sheep is a simple matter when done correctly, although some Merinos will be found

to be more stubborn than a mule. Get on its left side, place the left arm around its neck, with the other hand on its tail-head, and by tickling it slightly, the animal will walk briskly along.

To carry a sheep, if it be a small one or a lamb, stand at the rear and to the right, slip the right hand back of the sheep's right front leg and place it between the front legs. Lift it up slightly in front, and grasp the left hind leg just above the hock. Lift up, catching hold of both hind legs. This renders the sheep helpless, and it can be carried without struggling.

To load sheep into a wagon without a chute, two men can handle a small bunch quickly in the following manner: One man stands on each side of the sheep. The right hand of one grasps the left hand of the other between the forelegs, and the other hands are clasped in a similar manner under the flanks. Chutes are used where there are large numbers, and a goat acting as leader saves much time.

Shipping sheep singly in crates supplied with a gunny sack of hay and grain is accomplished with very little loss. The expressmen, as a rule, take good care to water the animal at frequent intervals.

Feeding.

As this is not a text on sheep management we merely wish to emphasize the importance of punctual feeding from the standpoint of hygiene.

On the western range, alfalfa, field peas and kale are largely used as winter feeds. The preg-

nant ewes are given a small quantity of oats towards lambing time. Alsike, clover, rape, rye, roots, and many other foods are used, depending on the locality and cost of feed. Timothy is very constipating, leading to "blind staggers," following impaction. Those sections supplied with "bunch-grass" and where the snow is not deep are fortunate, for nothing else is needed, except sulphur and salt.

In the East, and for fitting sheep for exhibition, silage, cabbage and concentrated foods of many kinds are used.

Shepherd's Calendar.

March: The lambing season. This depends greatly upon the locality and breed.

April: When about two weeks old the lambs are docked, branded, and the males castrated. The feet of the whole band should be attended to.

May: The sheep are sheared and dipped and started for their summer range.

June, July and August: Feeding in the forest ranges, often in sight of snow-capped mountains. This is one reason why western sheep are so healthy and thrifty; they are far above the parasite-infested lowlands. The lambs are weaned when about four to five months old.

September: Toward the latter part of this month, the band is slowly trailed back home. In the Northwest, fields of wheat and oats "stubble" are purchased to turn the sheep into. In Colorado field peas are used.

October: The band is culled, and the bucks

turned in. Towards the latter part of the month the feet are again trimmed if necessary.

November, December, January and February: Feeding at the home ranch, and selling lambs when the prices are favorable.

CARE OF THE EWE.

The period of estrum continues from two to four days, and the ewe will come in heat again in about sixteen days if not pregnant.



LAMBS AT SHEARING TIME CUT
AWAY FROM EWES.

The average period of gestation is about one hundred and forty-five days, or four and one-half months. Male lambs are carried a little longer. If a ewe goes over a week after her time, the chances are the lamb is dead. Before lambing, the ewes should be "tagged" by removing any filthy locks of wool.

Separating the pregnant ewes for the winter season is the best system, for then the danger of abortion from crowding and bruising is lessened. Only the brightest and cleanest of food should be fed to pregnant ewes.

Turnips and cabbage make a good green food ration, while mangels and sugar beets are not recommended before lambing. In parts of the west, along the coast, where green food grows the year around, these problems are solved by nature. Before lambing the food should be abundant and laxative, a pound of equal parts of bran and oats being a fine addition to the hay ration.

When the weather is not too stormy or wet, the animals should have plenty of exercise. This will prevent many cases of difficult parturition. The old English method of hauling a load of hay a mile from the sheep corral, compelling the sheep to follow it for their food, and then driving them back in the evening, was an excellent one.

In the early spring, after a hard snowy winter, when the band is turned out to pick over the rough parts of the ranch, many abortions and deaths occur among the ewes from eating brush, moss, or any green forage that may be full of turpentine or other toxic ingredients. Frozen roots, spoiled silage, mouldy hay, and an exclusive diet of timothy have caused the death of many a pregnant ewe.

When the lambing season arrives, the busiest time of the year on a sheep ranch is at hand. The ewes expected to lamb early should be given a roomy pen, dry, clean and quiet. As ewes seldom lamb between midnight and early in the morning, one should watch them at all hours, except this time.

When a lamb gets away from its mother and she later refuses to claim it, they should be put

in a pen together. If the mother butts it away, she should be tied up and the lamb allowed to suck. This usually causes a family reunion.

The various diseases and disorders of the ewe are considered in the section, "Diseases of the Ewe."

CARE OF THE LAMB.

If the lamb is born normal, and does not become infested with parasites, very little need be done to keep it in a healthy and thrifty condition.



HOW A LAMB IS DOCKED WITH HOT PINCHERS.

Courtesy American Sheep Breeder.

When an apparently "lifeless lamb" is dropped it may be possible to resuscitate it by the following method: Clean all mucus from the mouth and nostrils, and blow gently into its nose. Lay it on its belly and slightly tap each side over the lungs. A whiff or two of aromatic spirits of ammonia is beneficial.

For a chilled lamb, wrapping it up in a warm coat or blanket and giving a few drops of whiskey

in a little warmed water is good. In the several large sheep raising states that have lately gone "dry" aromatic spirits of ammonia may be substituted. The latter will also keep longer around a sheep camp. Spirit of camphor and sweet spirit of nitre both contain large amounts of alcohol, and may be employed as stimulants.

When a lamb must be raised by hand, remember ewe's milk is much richer in fat and somewhat richer in casein than cow's milk, as the following table will show:

MILK ANALYSIS.		
	Ewe	Cow
Water	80.82	87.27
Casein	4.97	3.02
Albumin	1.55	0.53
Fat	6.86	3.64
Sugar	4.91	4.88
Ash	0.89	0.71
	<hr/> 100.00	<hr/> 100.00

The specific gravity of ewe's milk is about 1.0341. No water should be added to cow's milk to feed an orphan lamb, but rather the richest whole milk that can be obtained. If the ewes have been fed oil cake the milk is increased greatly in fats, often causing scours in the lambs.

When the lambs are about two weeks old, on a bright, sunny day, the males should be castrated. Select a clean, dry place for this work, and with disinfected hands and knife, hold the lamb, and cut off the lower third of the scrotum. Pull the testicle and entire cord out. In older lambs the cord may be scraped off. If everything is kept clean no further attention is required. Keep the lambs by themselves for several hours, as they will lie

down and get trampled if put in with the rest of the sheep. Castrating in the evening has proven very successful with some breeders, as it gives the lambs a chance to remain quiet over night.

At the same time the males are castrated, all the lambs may be docked, branded, tattooed and marked. The easiest and most bloodless method of docking is to heat a pair of pincers red hot and use it to sever the tails; over a dozen lambs can be docked with one heating.

When the lambs are about four or five months old, or along in August, they are weaned. By this time they have learned to pick up almost enough feed to satisfy their wants, and merely taking them entirely away from the ewes, a day or two, will render them weaned.

At weaning time it is a good plan to separate the ram lambs from the others, although this is not done sometimes until they are six months of age.

A healthy lamb will become plump and make a steady growth. A stunted lamb seldom "catches up." It is remarkable how fast range lambs fatten in the fall while trailed back on stubble or field peas. Many a carload has topped the market from just this kind of feed.

CARE OF THE BUCK.

If the animal has been kept in good condition and given sufficient exercise, he requires but little attention. A ration of bran and oats fed a month or so before the mating season is conducive to vigor. Sugar beets and mangels should never be

fed bucks or wethers, for, as stated elsewhere, urinary calculi are apt to be formed, which, owing to the small caliber of the urethra—one-sixteenth of an inch—leads to death.

On the western range about one buck to thirty-five ewes is the usual number.

After the mating season the male should be given sufficient food to keep him in fair condition, but not fat. Exercise is the most essential thing in sheep hygiene. They are naturally roving animals, and the main cause of impotent bucks is traceable to lack of exercise which leads to vicious habits and excessive fat.

SECTION IV.

MEDICINES AND THEIR ADMINISTRATION.

GENERAL CONSIDERATION.

Comparatively few medicines³ are used internally in the treatment of sheep diseases. Due to the tortuous digestive system, drugs are very slowly absorbed and usually the animal is dead before action is obtained.

As most ailments that require medicinal treatment are emergency cases, such as poisons, parasites and injuries, large and heroic doses must be given, and repeated often.

It is well to remember the common remedies found in every household or sheep camp, such as salt, pepper, ginger, soda, turpentine and the like, for often one does not have access to a complete medicine chest. To be able to use what is at hand intelligently is better than to know the pharmacopeia by heart and overlook the simple remedies. Long treatises have been written on drugs, but the more experience one has in the treatment of sheep, the fewer drugs he will use. To not overdo the treatment requires as much judgment as to render adequate aid.

As many sheep are herded during the summer

³Quitman's "Synopsis of Veterinary Medicine" was the text consulted.

season far up in the mountains away from the haunts of civilization, and where veterinary attendance is not available except in extraordinary cases, veterinarians can serve their clients best under these conditions by outfitting a small medicine case of simple remedies and giving the herder explicit directions how to use them and also the conditions that may arise that will justify him in sending fifty, seventy-five or maybe even two hundred or three hundred miles for the veterinarian's services.

Part of the instruction given below can be adapted by the veterinarian to the use of the shepherd and given to him with such remedies as he deems necessary to be taken along in the camp when the herd is driven away for the summer.

Administering Medicines.

The restraint of sheep has been dealt with in the section on Hygiene.

Setting the sheep on its rump to drench it is inadvisable. Standing it in a corner is the best method to pursue, for then the danger of pouring a portion of the drench into the lungs will be obviated.

A two-ounce dose syringe is the handiest article with which to give medicine. Dilute the drugs well with water, raw oil, milk, sirup, or gruel, and introduce the nozzle between the lips in the interdental space. Do not hold the tongue, but keep the mouth closed, and the animal will swallow slowly. Proper restraint is half the battle.

To drench with a bottle requires patience and

skill; unnumbered sheep have been given mechanical pneumonia by this method. Small sheep or lambs may be straddled, while large ones should be backed into a corner where they cannot run away. The left hand should be placed on the lower jaw, with the thumb in the interdental space. Place the neck of the bottle on the tongue or near it, and pour in, very slowly, about half the contents of the bottle. Rest a minute or two between "drinks."

When a bottle is not available, a spoon may be used. Pouch out the lower lip and pour the medicine into the cavity so formed.

Mixing the medicines in thick sirup and smearing on the tongue or teeth in the form of an electuary is a convenient method.

Hypodermic medication may be performed in any part of the skin where the latter is denuded of wool.

Enemas are valuable in many cases. Adding a tablespoonful of glycerin to a pint of warm, soapy water adds to the efficiency of the injection.

Dips should be kept warm, and the animals treated only on bright sunny days. For foot troubles, the solution may be placed in a trough or shallow vat, several inches deep, and the band driven through it.

Dosage.

The relative dose of medicine given to a sheep is about one-fourth to one-sixth as much as given to a horse, and about four times the dose indicated for a human. The dose, however, varies

greatly with the circumstances, drugs being often indicated in very large quantities; e. g., antidotes for poisoning, well diluted with water or oil.

It is well to remember that a teaspoon holds one dram, or one-fourth of a tablespoonful.

A tablespoon is nearly equivalent to one-half ounce.

A common tumbler contains about eight ounces, or one-half pint.

A common tea-cup will hold about eight ounces; although most cups carried in sheep camps hold nearly a pint, as they are more for service than for style.

Depending on the age of the lamb, from one-third to one-half the size of the dose given sheep can be administered.

A Table of Frequently Used Drugs.

No complete table of drugs used in sheep practice can be given, because there are no two localities with exactly the same disorders. The veterinarian will soon become familiar with the ailments in his immediate vicinity and use the drugs indicated.

The following table is an outline of the drugs generally used, and the safe, but active dosage appended:

Drug	Dose for sheep
Acaciae mucilago	q. s.
Acetanilidum	3i
Aconiti, tinctura	m. xx
Alcohol	q. s.
Alumini sulphas	gr. xx
Atropinae sulphas	gr. 1/20

MEDICINES AND THEIR ADMINISTRATION.79

Drug	Dose for sheep
Balsamum Peruvianum	q. s.
Belladonnae rad. Flex.	m. xx
Bismuthum subnitras	gr. xx
Boricum, acidum	q. s.
Camphorae, spiritus	3ss
Cannabis Ind. Flex.	3ss
Chloral	3ii
Carbo ligni	q. s.
Creosotum, Beechwood	m. ii
Cupri sulphas	q. s.
Digitalis, Flex.	m. v
Dioscorea, Flex.	3ii
Ergotae, Flex.	3i
Ether	q. s.
Eucalypti, oleum	3ss
Formaldehydi, Liq.	3i
Gentianae, Flex.	3ss
Glycerinum	q. s.
Gasolin	q. s.
Hydrargarium chloridum mite.	3ss
Hydrogenii dioxidum aqua.	q. s.
Iodi, tinctura	q. s.
Lini, oleum	3viii
Magnesii sulphas	3vi
Nitrosi, spiritus etheris.	3ss
Nucis vom. Flex.	m. x
Olivae, oleum	q. s.
Opii tinctura	3i
Phytolaccae, Flex.	3i
Piperitae Menthae Oleum.	m. x
Potassi permanganas	gr. xx
Plumbi acetas	q. s.
Potassii iodi	gr. xx
Potassi Arsenitis, Liq.	m. xx
Petrolatum	q. s.
Rhamni Purshianae Flex.	3i
Rhei, Tinctura aromatica.	3i
Ricini, oleum	3iv
Santoninum	3i
Saponis, lin.	q. s.
Sodium chloridi	q. s.

Drug	Dose for sheep
Sodium hyposulphite	3ss
Sodium bicarbonas	q. s.
Spiritus vini gallici.....	3ss
Sulphur subliatum	q. s.
Terebinthinae oleum.....	3ss
Tinctura Ferri Chlorid.....	q. s.
Zinci sulphas	q. s.
Zingerberis, tinctura	3i

Of the drugs mentioned above, perhaps a dozen are commonly used. Due to the delicate taste of the sheep none can be given on the feed. All must be given as a drench or an electuary.

Preventive medication, such as dipping or removing animals from parasite—or poison—infested ranges, is far more successful and satisfactory than constant drugging.

Emergency Medicine Case for the Range.

Before trailing the sheep to the summer range it is well to provide the herders with an emergency medicine chest, and instruct them how to use each drug. Hints can be given how to treat a saddle-horse or a valuable dog as well as sheep out of the case. Less fatalities among the men themselves would occur if the sheep owners would secure a competent physician to give the herders a little talk on "first aid."

For the common emergencies among animals, the following list will be found useful:

- One dozen two-inch gauze bandages.
- Four one-quarter pound rolls absorbent cotton.
- One roll inch zinc oxide adhesive plaster.
- Ten pounds sulphur.
- Ten pounds Epsom salt.
- One gallon raw linseed oil.

One quart castor oil.
 One quart glycerin.
 One pint hydrogen peroxid.
 One pint tincture iodin.
 One pint spirit of camphor.
 One pint sweet spirit nitre.
 One pint tincture of iron.
 One quart olive oil.
 One gallon turpentine.
 One gallon pine tar.
 Two hundred, twenty-grain powders containing equal
 parts potassium permanganate and powdered alum.
 Several two-ounce dose syringes.

Disinfectants.

As prevention of disease and parasites is of the utmost importance in sheep industry, a knowledge of disinfectants and their germicidal powers is necessary.

On the western range, very little disinfecting is necessary except in infected corrals, shearing or lambing sheds, or feeding lots.

Official disinfectants as designated by the Bureau of Animal Industry mention the following:

1. A five per cent solution carbolic acid. Due to its present high price this is very little used.
2. A three per cent solution of liquor cresolis compound. This is a coal tar product. Many other well known coal tar dips such as Kreso, Sanax, Lysol, Chloro-naphtholeum and the like, which are merely trade names of the different manufacturers, are good and efficient.
3. A 1 to 1,000 solution mercuric chlorid. On account of its dangerous properties to animals from licking it, this is not much used for sheep.
4. Chlorid of lime, one pound to one and one-half gallons of water.
5. Formalin, one quart to five gallons of water.

For disinfecting a shed or corral, perhaps as good as any disinfectant is lime and sulphur dip. Put a half bushel of unslaked lime in a fifty-gallon barrel, and add enough water to make a smooth paste. Add about twenty gallons of water, stirring constantly, and then add the coal tar dip, about three gallons will be sufficient, and fill the barrel up with water. Allow to stand over night, and by not agitating the solution, one can use a spray pump with little annoyance from clogging.

The most common western method is to dilute the sediment from the lime and sulphur dips, and throw it around over the corral or pens.

For detailed formulae of the various dips, see Section on Parasites, page 161.

Blue vitriol and common lime are the solutions most used in foot rot on the range.

The Value of Postmortem Examinations.

Perhaps in no species of animal is an autopsy more valuable than in sheep. To ascertain with reasonable certainty the exact trouble is more than half the battle, and preventive measures can be taken to eradicate the malady, if at all practicable.

Sheep that have been dead more than twenty-four hours are not good subjects for postmortem examination. The putrefactive organisms and gas have caused such changes that one cannot tell anything about the original ailment.

Examine the head for grub; the trachea for lung worms; the fourth stomach for stomach worms; the liver for liver flukes; the skin for scab mites or ticks, and every organ for pathological lesions.

Poisons usually but not always cause a violent inflammation of the intestines.

Sometimes several or more autopsies are necessary to arrive at a correct diagnosis, and even then it is often the safer method to make a guarded one.

SECTION V.

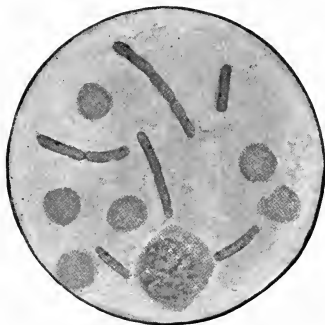
ACUTE INFECTIOUS DISEASES.

Anthrax.

Splenic fever; wool sorter's disease; splenic apoplexy; malignant pustule; anthracemia; mycosis intestinalis.

Cause: The *Bacillus anthracis*, a square-end rod-shaped germ; stains by Gram's method. Remains virulent for years.

Symptoms: In sheep the symptoms are very acute. Loss of appetite; rise in temperature; edematous swellings appear on flanks, and the skin may be covered with an erysipelas-like eruption. Dark, bloody, frothy mucus exudes from the nostrils, mouth and anus. Young animals are more susceptible to the disease than older ones, but the mortality—even in adults—is very great.



BACILLUS ANTHRACIS.

Fresh Sheep Blood Stained with Diluted Fuchsin Solution.

(From Hutyra and Marek.)

The diagnosis is determined by the postmortem findings; the "blackberry spleen" differentiating it from blackleg.

The usual channel of infection is through the

Texts consulted:

Hutyra and Marek's Pathology and Therapeutics of the Diseases of Domestic Animals.

Friedberger and Fröhner's Veterinary Pathology.

Moore's Pathology and Differential Diagnosis of the Infectious Diseases of Animals.

digestive system; the germs entering the blood and lymph streams from this source. Death ensues in from several hours to two days. The immediate cause of death is suffocation. The history of the disease in a given attack or locality is helpful in making a diagnosis, since where previous outbreaks have occurred, one will be constantly on the lookout. However, in any serious epizootic among sheep, a clinical diagnosis confirmed by a bacteriological examination is the only safe one.

Treatment: First, accurate diagnosis; second, rigid quarantine; third, slaughter of diseased animals and burning the carcasses; fourth, immunization and a change of range. The very best thing one can do in case of the appearance of this disease is to notify the nearest Federal or state live stock sanitary official by wire. Veterinarians must disabuse themselves of the belief that it is a reflection upon their professional ability and skill to call upon state or Federal officials in outbreaks of disease that are suspected of being highly contagious and susceptible of control only by concerted public action. It demonstrates a better ability to take this precaution a hundred times where later developments reveal it unnecessary than to fail to take it one time and thus permit the unnecessary infection of wide areas and as a consequence great loss perhaps for years to come.

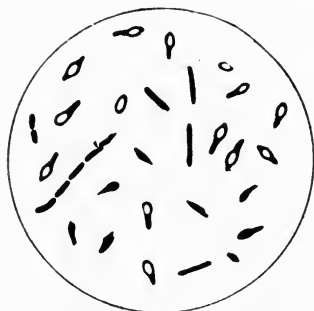
2. Malignant Edema.

Edema malignum; septicemia gangraenosa.

Cause: The anaerobic "Bacillus edematis maligni."

This is a wound infection disease often following castration. The germ greatly resembles the causative factor of anthrax, except that it has rounded ends. Like tetanus, it grows only in oxygen free cultures.

Symptoms: In general the clinical picture is much the same as that of blackleg. Usually the



BACILLUS OF BLACKLEG.

sheep is found dead, and others may show vague symptoms indicating that something is not exactly "right." The temperature is very high at the onset of the disease and a diarrhea is usually present. Crep-
itating swellings similar to those seen in blackleg

can be felt on the body; the respirations are labored; the pulse is wiry; and the visible mucous membranes cyanotic.

Due to the extreme difficulty in making a clinical diagnosis, a bacteriological examination should be made.

Treatment: This is a rare disease among sheep, and is very seldom seen on the range. It is usually found around the barn-yard and in low, damp places. No successful treatment has so far been found.

Prevention consists in moving the sheep to another range, preferably to a higher one. It is a quarantinable disease and should be reported to state officials immediately.

3. Blackleg.

Black quarter; quarter ill; symptomatic anthrax; gangrenous emphysema.

Cause: The Bacterium Chauveaui, a rather thick, straight germ, with rounded ends. It is a very difficult organism to eradicate, as the spores may live for years.

Symptoms: Only the greatest of care will enable one to differentiate this disease from certain forms of poisoning in sheep.

On the range the course of the malady is very rapid. When first seen, the animal has difficulty in walking; its abdomen is distended from bloating; a frothy discharge is seen oozing from the mouth, and the temperature is very high. The herder immediately diagnoses the trouble as poisoning, and many more die before expert assistance is sent for. When local symptoms are pronounced, such as crepitating swellings on the hindquarters, the diagnosis is comparatively easy to make.

Treatment: Purely preventive. This is done by immunization and removal to another range. Blackleg is rather rare among sheep, but one outbreak that came to the author's notice caused the death of over four hundred sheep before expert assistance was even called. Every known antidote for poisoning had been used to no avail.

4. Bradsot.

Braxy; gastromycosis ovis.

This is a disease much resembling blackleg. It is very destructive to sheep in Norway, Iceland,

Denmark, Germany and Scotland. It is seen in the lowlands along the coast, and when sheep are brought down from the mountain pastures and driven into infected ground, the loss is very great. It is not found in this country.

5. Hemorrhagic Septicemia.

Catarrhal fever of sheep; septicemia hemorrhagica ovum.

Cause: The *Bacillus ovisepticus*, a short, non-motile non-spore-forming germ, which will not stain by Gram's method, but stains with the anilin dyes.

Symptoms: The animal is dull; listless; the respirations are labored, and there is great thirst. The temperature is high, and there are present some muscular tremors. The latter symptom makes the disease very difficult to diagnose from some forms of poisoning. The high temperature simulates blackleg, and a very careful examination must be made to arrive at a conclusive opinion. A bacteriological examination should be made to confirm the diagnosis.

Fortunately, in this country hemorrhagic septicemia is a rare disease in sheep, but it is common in Europe and Argentine.

Treatment: Nothing practical has been found but prevention by removal to another range. Immunization has been tried, and the results have been fairly satisfactory.

6. Rinderpest.

While this is commonly a disease of cattle and

not found in this country, it has caused immense losses in other parts of the world. Southern Europe, Asia, the Philippines and Africa have been devastated time after time with this deadly plague. In some instances large losses of sheep and goats have occurred.

This disease became such a widespread epizootic that the first veterinary colleges were established to combat this malady alone.

Cause: Unknown.

Symptoms: Experienced veterinarians declare it greatly resembles hemorrhagic septicemia.

Treatment: As yet, no successful treatment has been devised. Quarantine and slaughter are the two methods used to combat it. Immunization with varying results have been tried.

7. Sheep Pox.

Variola ovina; pox.

Cause: Unknown. The purulent matter found in the cutaneous pustules seems to convey the virus.

Symptoms: The prodromal symptoms are a loss of appetite; high temperature, and, later on the bare or hairy parts of the skin, small papules appear. These are covered with scabs, and intense itching follows. The disease is not a fatal one, but the irritation causes a great loss of weight in affected animals. It is not a common disease in this country.

Treatment: As one attack confers immunity, light outbreaks are welcomed in the countries

where the disease is enzootic. Immunization has been tried, but with very little success. Hygienic care seems to be the best line of treatment. Differentiating the disease from common scab is the first problem.

8. Foot-and-Mouth Disease.

Aphthae epizooticae.

Probably no disease appearing among cloven-footed animals in this country has been so thoroughly discussed in the past several years as this one, consequently a mere summary is given here.

Cause: Unknown. The clear serum-like contents of the vesicles and the blood carry the contagium.

Symptoms: As this is an acute febrile disease, the first symptom noted is a high temperature usually accompanied by a slight lameness. The foot becomes swollen, feverish, and small vesicles which later become pustules are found in the interdigital space. Upon squeezing this, thick pus comes out in a spiral, worm-like shape, hence the colloquial term, "hoof-worm." Great care must be used to differentiate it from foot rot. Complications, such as lack of appetite, abortion in pregnant ewes, and vesicles on other parts of the body, as in the mouth and sometimes on the teats, may help one to exclude any form of rot. In the latter disease the hoof becomes gangrenous, and to one who has seen both, the difference between these two disorders is very noticeable. The history of an attack is perhaps more important in arriving at a diagnosis than are the lesions. The

fact that all kinds of cloven hoofed animals on the premises are affected; the low percentage of the susceptible animals that succumb; the lameness in the hogs; the "smacking" in cattle; the immunity of horses and mules; the mortality of the sucklings, etc., must be taken into consideration in differentiating this disease. Avoid a public announcement of the presence of this disease until the diagnosis is positive; but take no chances of permitting the spread of the disease through a failure to notify the proper authorities in every suspected case. The instructions issued by the Bureau of Animal Industry at Washington on this matter are as follows: "In all cases of foot-and-mouth disease, even where there are only slight grounds for suspicion of a new outbreak, the matter should be reported *immediately by wire* to the Chief of the Bureau; a detailed written report should be forwarded *as soon as possible*. This report should include a description of the lesions and their location, the number of susceptible animals of each species on the farm, the number of animals of each species affected, the temperature record, and the history, including the evidence, if any, of contagion." Heed them.

Treatment: This is a subject open to discussion. It has been proved that quarantine and slaughter, except perhaps in very high priced stock, is the only safe and sane method to combat the disease where there is a probability of its eradication. The course of the disease is from ten days to two weeks; it is but slightly fatal, except in some outbreaks where it assumes a malignant form and in

young animals, but its effect on weight and milk or wool causes a great economic loss.

It is a quarantinable disease, and as above stated one should waste no time in notifying the proper authorities of suspected cases. The failure to do this in the 1914 outbreak resulted in the expenditure of five million dollars by the Federal and various state governments in combatting this disease and a loss to the livestock industry from quarantines and interference with the marketing of livestock, probably four times as great. Twenty-five millions for neglect of this simple precaution!

9. Tetanus.

Lockjaw; trismus.

Cause: The *Bacillus tetani*, an anaerobic organism. It is a slender, spore-forming germ and has been called the "pin bacillus" and the "tennis racket bacillus."

Symptoms: Being a wound-infection disease, it usually appears among lambs after castration, docking, ear marking, or in rare cases, from umbilical infection. There have been cases where ewes have been infected after labor.

In young lambs, about a day or so after infection, they become dull, lose their appetite, and as the disease progresses, assume a stiff "saw-buck" attitude. The muscles in the neck become rigid, which causes an inability to swallow, and subsequent bloating is noticeable. Sometimes a profuse diarrhea occurs. Death occurs from suffocation.

This disease is quite apt to run a subacute course

in lambs infected from castration or docking wounds. They may be unable to put the nose to the ground to drink from a pail or even to nurse for as much as two weeks and yet retain their ability to swallow milk given as a drench. During most of this time, they may be able to walk without much difficulty and even to run rather swiftly in a straight line, and yet when down be unable to rise without help. These cases when down lie on the side with the legs extended stiffly, horizontally. In turning when running, they are almost sure to fall. If they fall in the warm sunshine and lie there for a time, a very high temperature up to 108 to 110 degrees Fahrenheit speedily ensues. Recovery is rare.

Once this affection appears in a flock it is apt to affect as high as twenty-five per cent of the lambs having access to the infected quarters after castration.

Treatment: After the characteristic symptoms appear among sheep, very little can be done. Since the infection occurs only among flocks having access to a much used corral, the entire band should be moved to other quarters. Immunization is practical only in high priced animals.

10. Rabies.

Hydrophobia; lyssa; mad-dog; canine rage.

This disease has assumed importance in the West due to outbreaks among dogs, coyotes and other predatory animals on the range. Much loss has occurred among sheep from this disease, and the zone of infection is constantly increasing.

Cause: Unknown. The virus is conveyed by the saliva. Negri bodies found in the brain confirm the clinical diagnosis. Remarkable success in diagnosing this disease from a blood examination has been reported recently.

Symptoms: In sheep, the period of incubation is unknown; there are practically no prodromal symptoms. In ewes, stamping the feet and a desire to butt everything in sight is noticeable. In bucks, the sexual desire is greatly increased. This stage of disease persists for nearly a week, and the animal finally drops to the ground from exhaustion and dies with paralysis.

The diagnosis can usually be made from the history of the case, together with the characteristic symptoms of the affected animals. Poisoning is often confused with this ailment by the herders, and in every doubtful case a microscopical examination of the brain should be made, as the autopsy reveals little or nothing.

Treatment: Infected animals should be destroyed and the carcasses burned. Extra precautions should be observed in watching the actions of the sheep dogs. The Pasteur treatment should immediately be administered to any person bitten by even a suspicious-acting dog. The expense of the Pasteur treatment is too great to be practical for ordinary sheep, although valuable ones may be given the Pasteur treatment. Dr. Zell has reported a successful inexpensive prophylactic treatment that he has used to some extent in an experimental way.

11. Tuberculosis.

Pearly disease; consumption; grapes; "white plague."

While sheep are not very susceptible to this disease, government reports for last year show over half-a-million dollars' worth of mutton condemned for this disease alone.

Cause: The Bacterium tuberculosis, a very small organism found chiefly in the lymph system. Because of the very extensive literature on this subject only a brief summary is herewith given.

Symptoms: A tuberculous sheep exhibits very few symptoms; a lack of thrift being the most noticeable. The visible mucous membranes are pale, while the wool is harsh and dry. The clinical picture greatly resembles infection by stomach worms, and only an autopsy will determine the exact trouble. In suspected cases the intra-dermal tuberculin test may be resorted to.

Treatment: At present, hopeless. An entire change of quarters and breeding stock is advised.

12. Ovine Caseous Lymphadenitis.

Pseudo-tuberculosis.

Cause: The Bacillus pseudotuberculosis ovis, a very delicate, non-spore-forming, rod-shaped germ. It stains with anilin dyes and by Gram's method.

Symptoms: There are no marked symptoms, and the disease is not discovered until after death. Many cases are reported by government inspectors

at packing houses; the malady seems widespread over the West.

The lymphatic glands become caseous, and in individuals where great enlargement has taken place, emaciation is present.

Treatment: Nothing but prevention is known at the present time.

13. Actinomycosis.

Lumpy jaw; big jaw; wooden tongue.

Cause: Actinomyces bovis, or ray fungus.

Symptoms: Inability to chew food is the first symptom noted, followed by a swelling on the jaw. The tongue may be affected, and the animal succumb to starvation. It is a very rare disease in sheep, but cases are on record.

Treatment: None practical on the ranges. Slaughter under government inspection is perhaps the best method. Where but a single or at most but a few individuals are affected on a small farm the administration of potassium iodid may be resorted to.

14. Glanders.

Sheep have never been known to become infected through natural sources. This disease was formerly confused with hemorrhagic septicemia.

15. Contagious Abortion.

Another disease seldom found in sheep. Usually the form of abortion occurring among ewes is due to toxic ingredients found in the food, or to exposure and bruises.

16. Piroplasmosis.

Carceag; ictero-hematuria; malarial catarrhal fever.

A disease not found in this country, but existing principally in the Balkan states.

Cause: Piroplasma ovis, resembling in shape the causative factor of Texas fever in cattle.

Symptoms: High temperature; loss of appetite, and bloody urine.

Treatment: Wholly preventive.

17. Foot Rot.

Lip-and-leg ulceration.

Two forms of foot rot are recognized on the western range. One is non-contagious, and is due entirely to wet weather and standing in mud which softens the hoof and produces a condition practically the same as scratches in horses.

The second type of foot rot is caused by the *Bacillus necrophorus*, which, when affecting the mouth at the same time, is called "lip-and-leg ulceration," and in some stages might be mistaken for foot-and-mouth disease by the inexperienced.

Symptoms: The contagious form exhibits very marked symptoms. The affected sheep limps; swollen areas are found around the coronary band, with a separation of the hoof, and little gangrenous spots having a very putrid odor occur around the interdigital canal; sometimes the infection extends to the eyes and nose and, in females, to the genital organs.

Treatment: Driving the band through a trough containing several inches of copper sulphate solution—one pound to a gallon of water—usually results in improvement. The worst infected feet should be trimmed with a sharp knife before treating. Pure Balsam of Peru is an excellent local application where there is much gangrene.

18. Septicemia.

Blood poisoning; pyemia.

This is a term used when invading organisms of the pus or coli communis type enter the circulatory system, and cause such specific diseases as navel-ill in the lamb (page 133) or septic metritis (page 142) in the ewe, which see.

SECTION VI.

DISEASES OF THE BLOOD.

1. Anemia.

Acute anemia may be caused by some form of traumatism, such as may result in a severed blood vessel; or it may be caused by epistaxis or phlebotomy.

Chronic anemia is usually the result of internal parasites, such as stomach worms; external parasites, as the scab mites, or the ingestion of large quantities of marshy, watery food. Extensive feeding of beets, turnips or other foods deficient in proteids may cause this condition.

Anemia is primarily a symptom of some disorder.

Symptoms: The manifestations of this ailment are very pronounced in sheep. The skin, instead of being of a pinkish hue, is a paper-like white. Later, the animal becomes dull, loses its appetite, becomes weak, is not able to stand up, and death from suffocation ends the clinical picture.

Treatment: This consists in removing the exciting cause, be it parasites, exposure, or lack of exercise and supplying good nourishing food. Some form of iron should be fed the affected animals *ad lib.*

2. Red Water.

Sanguineous ascites.

This ailment is due to feeding frosty turnips or other watery roots that have been frozen.

Symptoms: In the morning, upon going out to feed the animals, several sheep will be found to have no appetite. The breathing will be labored, and considerable bloat is present. A swelling is often noticed under the lower jaw and the under side of the neck. Constipation is followed by a profuse diarrhea. The clinical picture greatly resembles poisoning.

Treatment: The chances for recovery depend on how long the disorder has been present. If the animal is anemic, young and delicate, the prospects for successful treatment are not good. A complete change of quarters, food and water is recommended. The following may be tried:

R

Fer. chlorid. ʒi
Oleum lini q. s. ad. ʒviii

M. Sig. Give tablespoonful once daily.

3. Pining.

This disease is not found in this country. It occurs in England, where many plants are found that have a tendency to constipate. The onset of this disease is very insidious; it runs a course of from a week to a month and ends fatally.

Symptoms: The wool becomes harsh; the eyes dull; the mucous membranes pale, and towards

the end, the sheep lies down a great deal. Finally, it becomes too weak to get up, and dies from inanition.

Treatment: The only treatment known to be of value is a change of range, to prevent an extension of the disease. It is possible also that animals in incipient stages of the disease may be saved by this means.

SECTION VII.

DISEASES OF METABOLISM.

1. Obesity.

This is a rather rare disease among sheep; always secondary to some other trouble. Cases of non-pathological obesity will be eagerly purchased by the butcher.

2. Rachitis.

Rickets.

This disease is due to a deficiency of lime salts, occurring almost exclusively among lambs.

Symptoms: The animal becomes delicate and does not thrive. The legs become crooked and pliable, and the "bow-legs" in front are very noticeable.

Treatment: Supply the necessary bone-building mineral salts. The following is excellent for lambs:

R	Syr. lactophosphate	3viii
	Cod-liver oil.....	3xvi
M. Sig. One ounce daily with dose syringe.		

If the patient is a suckling, the ewe can be given lime-containing foods and the calcium phosphate mixed with molasses and given as an electuary.

3. Wool Eating.

This is more of a habit among sheep than a disease. Usually when a band of sheep are kept in

close quarters, one or two may become warm and itchy and bite their wool. This leads to more biting and others imitate it. A few animals may die from ingesting too much wool, which form balls in their intestines, causing an obstruction. Others seem not to be affected in any way whatever.

Treatment: This consists in removing the wool-eaters from the rest of the flock, and giving each one a hypodermic injection of one-tenth grain apomorphin once daily for three or four days.

4. Diabetes.

This is a very rare affection of sheep; the cause is not known. It has been classed variously as a disease of the kidneys, liver and of the blood.

Diabetes insipidus is a condition whereby large quantities of urine, with no excess of sugar, are voided.

Diabetes mellitus indicates that large quantities of sugar are being passed.

Treatment: Slaughter under government supervision, with a change of diet for the apparently healthy members of the flock.

SECTION VIII.

DISEASES OF THE URINARY ORGANS.

1. Hematuria.

Red corpuscles in the urine, causing the latter to assume a reddish color, is a condition often following the ingestion of frozen or poisonous forage, severe injuries to the abdomen, and renal calculi.

Treatment: Is purely symptomatic. Clean food, with hygienic care, usually prevents the trouble from extending to other members of the band.

2. Uremia.

Uremia is a condition in which the solid constituents of the urine are retained in the blood circulation.

The exciting cause may be a retention of the urine in the bladder, caused by urinary calculi, or a paralysis of the latter, due to some form of poisoning.

Symptoms: It is very difficult to differentiate from poisoning, or abdominal injuries, until one can detect the urinous respiration. After a period of intense pain, stupor and paralysis ensue and the animal dies in a comatose condition.

Treatment: There is no successful treatment, and immediate slaughter should be advised.

3. Nephritis.

Inflammation of the kidneys; renal inflammation.

This is a secondary condition, following the invasion of parasites; infectious diseases; injuries; exposure to cold and rain, and poisonings.

The symptoms are mainly associated with the primary disorder, and as urinary analyses are impractical in routine work with sheep, very little can be done.

The treatment is symptomatic and not very successful.

4. Rare and Unimportant Diseases of the Urinary Organs.

Occasionally diseases of the urinary tract other than those mentioned in the foregoing are found in sheep. Usually they are not recognized until after death. Among these may be mentioned cystic kidneys, renal calculi, cystitis, and tape worm cysts—the *Echinococcus polymorphous*.

SECTION IX.

DISEASES OF THE CIRCULATORY ORGANS.

1. Pericarditis.

Due to the fact that the sheep is such a dainty eater we find no traumatic pericarditis such as



"STUNTS" WITH THE LARIAT.

A sheep camp is often located 50 to 200 or even 300 miles from the home ranch and the camp tender's life is a monotonous one.

occurs in the bovine. Other forms are almost unknown.

2. Dropsy of the Pericardium.

When this occurs it is usually a secondary affection due to poisonings, parasites in the liver, or chronic inflammation of the kidneys.

3. Hypertrophy of the Heart.

This is a secondary ailment, usually resulting from the effects of parasites in the blood stream.

4. Valvular Diseases.

This is co-incident with, and caused by the same pathological conditions as hypertrophy of the heart.



COUNTING SIX THOUSAND.

Sheep practice in the range country does not take the veterinarian over paved streets or even surveyed roads.

These diseases of the heart in sheep are rarely, if ever, diagnosed during life. The chief object in mentioning them is to enable the practitioner to guard against invasions of similar nature in the apparently healthy members of the flock.

SECTION X.

DISEASES OF THE RESPIRATORY ORGANS.

1. Epistaxis.

Hemorrhage from the nose; nasal hemorrhage; bleeding from the nose.

This is merely a secondary condition, following injuries to the head and nose, parasites, and acute infectious diseases.

Treatment: When the blood shows no sign of coagulation tampons of absorbent cotton, saturated with tincture of iron, tannic acid, alum, turpentine or adrenalin chlorid, charcoal or even earth, may be applied.

2. Nasal Catarrh.

Snuffles.

This ailment ordinarily results from exposure to the cold or rain; dipping or shearing too early, or from an invasion of parasites. (The symptoms are obvious.)

Treatment: Mainly consists in removing the exciting cause. Pine tar may be smeared over the nostrils, and the animal given clean, dry quarters. The following given for several days may abort an attack of pneumonia as a complication:-

R

Creosoti, Beech.	3ii
Spts. camphorae	3i
Ol. lini q. s. ad.	3viii
M. Sig. Give one tablespoonful three times a day.	

3. Non-Parasitic Bronchitis.

Frequently a sequela of nasal catarrh.

Cause, symptoms and treatment practically the same as for nasal catarrh.

Verminous bronchitis, caused by lung worms, is considered in the section on parasites.

4. Japp Disease.

This is a disease not found in this country, but common in parts of Germany. It is characterized by an intense bronchitis. No cause nor cure has yet been discovered.

5. Pneumonia.

Inflammation of the lungs; lung fever; pneumonitis; and congestion of the lungs.

Three types are recognized in sheep:

- a. Parasitic—due to lung worms.
- b. Traumatic—caused by drenching.
- c. Common congestion of the lungs, caused by exposure; chills; wet weather, and as sequela following nasal catarrh or bronchitis.

Symptoms: These are characteristic, but very difficult to differentiate from acute poisoning, at the onset. Cough; labored respiration; loss of appetite; congestion of the visible mucous membranes, followed by weakness, are present, and often followed by death. In large bands, as many

as fifteen hundred sheep have succumbed within a few days, during a season of wet or cold weather.

Treatment: In no disease are hygienic measures more important, and when these cannot be given, attempts at medical treatment are useless. Camphor and creosote, such as has been suggested for nasal catarrh, or spartein sulphate, given in five-grain doses, hypodermatically, may be given.

6. Pleurisy.

Inflammation of the pleura; pleuritis.

This affection is a common sequela of pneumonia.

Symptoms: The manifestations are quite characteristic. The animal grunts as it breathes, and the flanks are more used than the chest. There is a loss of appetite and suspension of rumination. On percussion, dull sounds are heard on the lower edge of the chest.

Treatment: When this disease has become established, therapeutic measures are more or less useless. In valuable animals, fifteen grain doses of potassium iodid may be given three times a day. The prognosis is grave.

SECTION XI.

DISEASES OF THE DIGESTIVE SYSTEM.

Disorders of the digestive system probably cause more losses than from all other sources combined. Errors in feeding, parasites, poisons, and predatory animals all take their toll of life in large numbers, but all fall far behind those ailments originating in the alimentation in the extent of loss occasioned the sheep industry.

1. Stomatitis.

See Section on Diseases of the Lamb (page 137); also Foot Rot (page 97), and Foot-and-Mouth Disease (page 90).

2. Choke.

Obstruction of the esophagus.

This a rare condition found in sheep, but when it does occasionally occur from the lodgment of a sharp pointed piece of root in the esophagus, great excitement reigns among the sheep herders. They seem to think an animal breathes through its gullet, and a few moments' delay will cause suffocation, and death.

Symptoms: The manifestations of this ailment are very pronounced. Labored breathing; sudden loss of appetite and rumination; bloating; normal temperature, and attempts to swallow, all differentiate the clinical picture from acute poisoning for which it may be mistaken at the onset.

Treatment: If the obstruction can be felt in the neck, massage may be tried. An equine catheter may be used as a probang, and the obstruction dislodged by its steady pressure. A quarter grain pilocarpin administered hypodermically often gives relief within an hour or so.

The great danger is from the bloating. The use of the trocar should not be neglected if at all indicated, for collapse in sheep occurs when least expected. Due to the heaviness of the fleece we often do not detect intense tympany in sheep until it is too late to save the animal.

In case the obstruction proves stubborn and "watchful waiting" avails nothing, immediate slaughter may be advised.

3. Bloat.

Hoven; blasting; meteorism.

This condition is a common one in the West; large numbers of sheep are lost annually from acute bloat. Any kind of forage may cause the trouble, especially after a rain. Wet alfalfa is particularly deadly.

In the fall, after having been on the summer range, the sheep are trailed leisurely back over the rich farming sections to the "home ranch." Wheat or oats stubble is rented by the sheep man and the animals turned in. Hungry for grain, it is remarkable how much the animals can pick up in a few hours. If there is any alfalfa near and available, trouble may ensue, not only from bloat, but from founder. Quick action is required by the attending veterinarian, and the treatment

heroic. The small dose teaching of text-books must be cast to the winds, and the medicines given in quantities that would cause an inexperienced veterinarian to shudder.

Symptoms: One or more animals stand with a look of helpless pain; respirations are labored, and the abdomen distended in an "apple-shape." Soon the animal staggers, tries to stand up, but drops to the ground and succumbs in a convulsion, the immediate cause of death being suffocation.

Treatment: Thousands of "sure cures" for bloat have been recommended. If they are available, it is suggested that turpentine, oil of eucalyptus, aromatic spirits of ammonia, formalin, fresh milk and coal oil be used. As this is a "first-aid emergency," one must think and act quickly, and be able to use what therapeutic agents are at hand.

We will suppose a hundred head of sheep have had access to a "big feed," and the animals are not only bloated but foundered. Here we have a complicated condition—a double calamity—and our measures must be directed, first, to lessen the formation of gas, and next, to alleviate the intense congestion of blood in various parts.

Two buckets of medicine are hastily mixed up, each containing two gallons or two hundred and fifty-six ounces, which will treat one hundred and twenty-eight head, giving each animal a two-ounce dose syringe full.

In prescription "A" we figure on giving one drachm each of turpentine, oil of eucalyptus, aromatic spirits of ammonia in enough raw linseed oil

to make two ounces. Consequently our prescription would read:

R

Spt. Ammon. Aro.

Ol. eucalypti.

Ol. Terebinth. aa..... ʒxvi

Ol. lini q. s. ad..... Cong. ii

M. f. sol.

Sig. One two-ounce syringe full at once. Repeat in fifteen minutes in subacute cases.

For the laminitis, the following can be given as soon as the bloat has subsided to such an extent that the animal seems to be somewhat improved.

R

Kali permangan.

Alumen sulph. aa..... ʒviii

Aquae q. s. ad..... Cong. ii

M. f. sol.

Sig. One two-ounce dose syringe full an hour after first medicine has been given.

By the use of three or four syringes and grouping the help in pairs—one to hold the animal, and the other to administer the medicine, a hundred head can be gone over in a few minutes. The main thing to impress on the ones who administer the medicine is to give the half-suffocated animal plenty of time to swallow the drench.

In case the before mentioned drugs are not available, with less success one may resort to ground ginger, milk, black pepper, or even whiskey, which is usually available in a sheep camp, although grudgingly supplied for this purpose.

4. Impaction of the Rumen.

This is a chronic bloat or a distension of the rumen caused by fermenting food of a solid nature.

Symptoms: Dullness; loss of appetite and rumination; doughy feeling in the flank, the rumen seeming to be of the consistency of a mass of dough.

Treatment: Give one-quarter pound Epsom salt in a quart or so of lukewarm water, to which can be added several drams of aromatic spirits of ammonia or fluid extract ginger. The triple sulphocarbolates are also useful in this condition where there is much gas.

5. Grass Staggers.

Fardel bound; drying up; staggers.

Impaction of the third stomach (the omasum or manyplies) is a very fatal condition and treatment has proven to be of little value. Upon autopsy, the spaces between the leaves of this stomach will be found packed full of dried material, and the mucous membranes nearly black.

Treatment: Large doses of salts, together with pilocarpin, may do some good and are worth trying, but the prognosis should be grave. When delirium is present, perhaps slaughter is the most humane thing that one can do.

6. Constipation.

Impaction; clog; twist, wool balls.

In adult sheep this often occurs from dry pasture and insufficiency of succulent food and water. Timothy hay will also cause this condition, even with plenty of salt and water. In lambs, wool balls is a frequent cause.

Symptoms: Loss of appetite; "humped up" appearance; attempts to defecate; colicky pains; and hard masses of feces in the rectum.

Treatment: For a sheep of ordinary size, that is not too "far gone", one may attempt treatment. Four ounces Epsom salt dissolved in a quart of water, to which is added one-half ounce of fluid extract of dioscorea to prevent griping, may be given several times daily for several days. An enema, containing half an ounce of glycerin, is always useful. Laxative food, such as whole oats and bran, equal parts, should be given when the animal regains its appetite. Do not give too much treatment, or the animal may "die getting well."

In suckling lambs, give the ewe a tablespoonful of sodium hyposulphite per day. The lamb may be given one or two ounces of castor oil, together with an enema.

7. Colic.

Stretches; belly-ache.

In sheep this condition usually arises from eating spoiled forage, frozen roots or mild poisons.

Symptoms: The animal stretches out so far that it appears "sway-backed," hence the term, "stretches." It lies down and then gets up again, and appears to be in great pain.

Treatment: In sheep, one-half ounce each of fluid extract dioscorea and sweet spirit of nitre given in a little water has been found to be useful. In cases of much fermentation, thirty grains of the sulphocarbolates, with a drachm of fluid ex-

tract ginger, may be given. Turpentine, oil of peppermint, or any of the carminatives or stomachics may be given.

Lambs may be given one-half the above dosage. The ewe if suckling her young may be fed laxative food, and a tablespoonful of sodium hyposulphite per day.

8. Diarrhea.

The Skit or The Skite.

In sheep three forms may be recognized:

Sporadic or non-infectious diarrhea of the newborn lamb.

Infectious diarrhea. Considered in the section in diseases of the lamb.

Common dysentery of sheep. This is caused by spoiled food; exposure; lack of exercise, or the symptom of some acute poisoning or infectious disease.

Treatment: Successful treatment is largely symptomatic. Immediate removal of the exciting cause is necessary. Twenty grains of subnitrate of bismuth given in a little condensed milk is good. Triple sulphocarbolates, salicylic acid, salol, castor oil, linseed oil, milk of bismuth all have their place, and many more drugs have been usefully employed in this disorder. Hygienic care will do much to alleviate the trouble.

9. Enteritis.

Inflammation of the bowels.

Four types of enteritis in sheep are recognized: *Simple, or non-toxic enteritis.* This type is

caused by chills; eating irritating food; foreign bodies or parasites in the intestinal tract. It is also a sequela of constipation or diarrhea.

Croupous enteritis. This occurs from feeding too much chaffy food, such as "straw-stack and scenery" in the spring, following a hard winter. Dram doses of sodium bicarbonate several times daily, with nourishing foods, seem to do as much good as anything yet tried.

Mycotic enteritis. This is the most common type among sheep. It is due to the ingestion of mouldy or fermenting foods. Thousands of sheep are lost yearly from this disease alone. The trouble is especially fatal among pregnant ewes, causing abortion, and later, death from metritis. Often the most painstaking and careful examination is necessary to arrive at a correct diagnosis.

The symptoms are sudden and severe. There is a complete loss of appetite; dullness; colicky pains; constipation, followed by a copious diarrhea, in which are long strings of slimy mucus. Paralysis completes the clinical picture, and death occurs in a stupor-like condition. The exact kind of poison or toxic ingredient in the food largely controls the symptoms, and sometimes they are very violent in character. The history of the case, and an autopsy on animals already dead, help one to arrive at a conclusive diagnosis.

The treatment in the main is unsatisfactory, for the ailment has usually progressed too far for medicinal aid to accomplish much. Stimulants, anti-ferments, and intestinal antiseptics, together with rectal injections, complete the treatment. Only in

case of large losses or fear of some contagious disease is expert assistance ever called.

Toxic enteritis. See section on Poisons.

10. Piles.

This condition is very rare in sheep. Complete withdrawal of food for several days, with applications of belladonna ointment to the affected parts, is all that is required.

SECTION XII.

DISEASES OF THE LIVER.

1. Icterus.

Jaundice; yellows.

This disease is frequently seen in packing houses. It is very rarely noticed until after slaughter, except in advanced cases. It is commonly caused by the liver-fluke; for a complete consideration of this subject see the section on Parasitic Diseases of Sheep. Lead poisoning has also been known to cause this disorder.

Treatment: If of parasitic origin, treatment is, of course, out of the question. Laxative food, combined with two-ounce doses sodium phosphate, may relieve simple cases.

2. Hepatitis.

Inflammation of the liver.

When seen, it is usually the result of feeding on marshy land when the forage is too rich in proteid content.

The only practical treatment consists in change of feed and plenty of exercise.

3. Lupinosis.

See Section on Poisons.

SECTION XIII.

DISEASES OF THE PERITONEUM.

1. Ascites.

Dropsy; abdominal dropsy; hydrops ascites.

This is a comparatively common ailment among sheep on the western range, and is not a disease in itself, but the visible symptom of some chronic affection of a vital organ of the body, such as the heart, the kidneys, the lungs, the mesenteric glands or the portal vein.

It is the term applied to the collection of serous fluid found in the peritoneum not due to inflammation.

Under the general head of ascites may be mentioned hydremia, which is an increase of the fluid parts of the blood with a corresponding lessening of the solid constituents. This frequently is seen in parasitic invasions, or in chronic lead or zinc poisoning, and is known among sheepmen of certain localities as "dry rot."

Symptoms: These are self-evident, but the following facts should be kept in mind:

a. Gradual enlargement, especially a bulging out posterior to the last pair of ribs. In shorn sheep this is very noticeable.

b. Palpation of the lower part of the abdomen produces the typical dull sounds, indicating the presence of fluid, while the upper part is tense, light and gives a drum-like sound.

c. Raising and lowering the animal gives forth a "swishing" sound, as the fluids roll back and forward.

d. Holding the animal up by the hind legs accelerates breathing as the fluids roll forward and press on the diaphragm. Also, tipping the sheep to one side causes a distension on that side.

e. Normal temperature.

f. Rumination becomes lessened; the appetite is greatly diminished, and later, the animal becomes dull, and mopes around: The visible mucous membranes become pale; the body emaciated, and the general verdict around the sheep camp is that the animal has the "rot."

The important thing to remember is to differentiate this practically incurable, non-contagious disease from:

a. Pregnancy. No disturbance of the health.

b. Peritonitis. In this condition there is pain, fever, with all its attendant disturbances of the general health.

c. Obesity. This occurs usually in old, closely confined animals. Range sheep are seldom troubled with this malady.

d. Paralysis of the bladder, or even rupture of that organ, due to urethral calculi of bucks and wethers. In this trouble there are found colicky pains, high temperature, odor of urine on the breath, followed by collapse and death. In this condition, at the first symptoms, great care must be taken to differentiate the troubles.

e. Other rare but possible ailments, such as pyometra, abdominal cysts, hydrometra, abnor-

mally large tumors, cystic kidneys, degenerated kidneys, or mummified fetuses in ewes. In some cases large quantities of impacted feces have been known to cause the distension of the whole abdomen.

These have been gone into in detail to prevent the embarrassment consequent upon a superficial examination and a too hasty diagnosis.

Treatment: In cases of long standing, slaughter is advised. If some pure-bred animal of high value contracts this disease during the show circuit, one may alleviate the trouble by giving daily twenty drops fluid extract pilocarpin, or one-half dram each of resublimed iodine and potassium iodide dissolved in a couple ounces of water.

2. Peritonitis.

Only seen as a secondary condition following bruises, wound infections, enteritis or puerperal infection. The treatment should be symptomatic; the results are usually very unsatisfactory.

SECTION XIV.

DISEASES OF THE BRAIN AND CORD.

Sheep are subject to many disorders of the brain and cord, but most of these are of parasitic or toxic origin, and very little can be done to alleviate the actual condition. We can, however, by careful autopsies, find the existing cause, and take preventive measures to preclude further extension of the trouble.

1. Encephalitis.

Inflammation of the brain.

This is caused by the invasion of the "gid" parasites; fractures of the skull; exposure, and poisons.

There is no known treatment that is satisfactory.

2. Apoplexy.

Under this heading may be grouped sun stroke, heat stroke, epilepsy, fits and convulsions.

It is usually of parasitic origin, except in very warm weather and in animals that are abnormally fat.

Except for the removal of the exciting causes, no treatment is practical.

3. Paralysis.

Frequently a sequela of acute infectious diseases, poisons, intestinal parasites, or cysts in the brain. In lambs it is associated with eclampsia of the ewe, both being caused by poor food, exposure or the infection that causes abortion.

When of non-parasitic origin, twenty-grain doses of potassium iodid given in an ounce of water several times daily will do as much good as anything.

4. Gid.

See section on Parasites.

SECTION XV.

DISEASES OF THE ORGANS OF LOCOMOTION.

1. Rheumatism.

Cause: Usually damp quarters; exposure; chills, or watery food.

This is a very rare trouble in sheep but sometimes appears as an enzootic due to the causes enumerated above.

Symptoms: Sometimes in the first stage, a very high temperature is recorded, with labored respiration and stiffness of the gait. This causes the trouble to be very difficult to correctly diagnose on account of the similarity of symptoms found in pneumonia, poisons, and acute infectious diseases.

Treatment: Removal of the exciting causes, together with hygienic care. Twenty-grain doses of potassium iodid or ten-grain doses sodium salicylate several times daily may prove beneficial.

SECTION XVI.

NON-PARASITIC DISEASES OF THE SKIN.

Only after the most careful examination should a diagnosis of non-parasitic disease of the skin be made, and then it is the best policy to keep a close watch on the affected animals and to isolate them from the apparently healthy ones.

1. Non-Parasitic Itch.

This condition is so rare in sheep as to merely merit the mention that it may and does occur, the exciting causes being rich food, lack of exercise or crowding.

The treatment is removal of the exciting cause.

2. Alopecia.

Falling out of the wool; baldness.

This is frequently seen on the range, and to the inexperienced, looks like scab. Ewes that have lost their lambs and have had severe attacks of mammitis or "blue bag" are the common victims. Sometimes lack of food and exposure are the contributing factors.

No treatment has been found successful, except to let it alone, and in case of old ewes, prepare them for market.

3. Eczema.

This condition may arise from insect stings, cockle-burrs, rain storms followed by rain rot, or too strong dips.

Five classes of eczema are recognized, although in practical work, everything not scab is commonly called eczema.

Chronic squamous eczema is a disease of parasitic origin usually, such as liver fluke or lung worms. It may also be due to lack of proper care.

Greasy heels, resulting from muddy or damp ranges or pens.

Fat scab, due to dampness, often called "rain-rot."

Solar eczema, due to irritations from the rays of the sun immediately after shearing.

Intertrigo or erythema of the claws and interdigital space due to friction by sand or the like getting into the parts.

Treatment: Removal of the exciting causes, and the feeding of light, nourishing foods.

4. Rash.

"Buckwheat rash," as it is called, occurs in warm weather in sections of the country where this grain is extensively raised.

5. Acne.

Known as "summer scab." Closely associated with eczema.

6. Ring-worm.

This affection is very rare in sheep. The disease usually makes its appearance on the neck and back, forming a hard crust over the part infected.

Scrubbing the hard scabs until they are softened, and applying tincture of iodine to the raw surface usually results in a speedy recovery.

SECTION XVII.

DISEASES OF OBSCURE ORIGIN.

1. "Nibbling" Disease.

This disease, also known as "trotting disease," is a very rare affection of sheep in this country, if it occurs here at all, but is common in Germany. The cause has never been fully determined. It was not known in Germany until the fine-wool breeds were introduced into that country. It is most frequent in young rams.

Symptoms: The first noticeable symptom in a ram is excessive timidity; later, they begin to tremble, and have a very staggy gait. In the latter stages of the disease the animal nibbles itself on the back and loins, and in several weeks to a month, the victim dies of exhaustion.

Treatment: The most important thing is correct diagnosis. Immediate slaughter is advised, and new blood used in mating. As "gid" produces some similar symptoms, a careful examination must be made to arrive at a correct conclusion.

2. Louping-ill.

Mad-staggers or trembles.

Another obscure disease not found in this country.

Inflammation of the spinal cord from some unknown cause is thought to be the exciting cause. The trembling, twitching, grinding of teeth and

general paralysis follow in rapid succession, leading to death.

The treatment is merely preventive, such as removal to other ranges; the introduction of new blood in the form of unrelated sires, and nourishing diet.

3. Big Head.

A peculiar condition found in parts of the West, especially in the arid desert plains. The cause, cure or prevention is absolutely unknown at the present time.

It occurs in the spring when the sheep are being driven from their winter camps to the forest ranges.

The first symptom is a refusal to eat, and the animal becomes restless as if in great pain. The head begins to swell, and the ears become purplish in color. The clinical picture much resembles purpura hemorrhagica in the horse. Death usually takes place in from several hours to a day or two, although some animals recover.

If the ears be scarified, a serous fluid, of a slightly reddish color, oozes forth; the animal seems to prefer to stand in water.

The rough and ready treatment of the sheep man is to throw the affected animal into a puddle of water or a snow-drift, if the latter is available. A certain number get well, but whether this heroic treatment has anything to do with the recovery is unknown.

4. Pustular Eruption of Lambs.

See section on Diseases of the Lamb (page 137).

SECTION XVIII.

DISEASES OF THE LAMB.

1. Congenital Defects.

Imperforate anus, unless quickly discovered, is incurable. If it be diagnosed early, many cases are amenable to surgery.

Hernia or rupture is rare and difficult to treat. Usually, on the range, the lamb is so stunted that it is knocked in the head.

“*Skin drying*” is caused by the ewe not being able to lick the new-born lamb. Later, its mother will not own it, and, if not attended to promptly, it dies from hunger and cold.

Umbilical hemorrhage or bleeding from the navel sometimes becomes serious. Tincture of iron chlorid applied with a cotton tampon will usually stop the flow of blood. A stimulant should be given, such as a little brandy or aromatic spirits of ammonia.

Suffocation is due to a twist of the umbilical cord during birth, and the lamb is born dead.

2. Reviving “Lifeless” Lambs.

When an apparently lifeless lamb is born, it may be revived in many cases by removing all mucus from the nostrils and mouth; breathing into the nostrils, and working on the chest as in reviving a drowning person. A very successful

method, as practised by some breeders, is to immerse the lamb in a bucket of water that is about blood warm, pouring in a little hot water, to increase the heat. Dry thoroughly, and wrap in a blanket. Later, when it is able to swallow, administer a stimulant.

3. Retention of the Meconium.

When the new-born lamb does not pass feces promptly, it begins to show signs of colicky pains, fever, and soon succumbs to inflammation of the bowels.

The treatment usually successful, if not delayed too long, is an enema of olive oil. A teaspoonful of castor oil may also be given on the tongue.

4. Navel-ill.

Joint-ill; blood poisoning; pyo-septicemia of sucklings; omphalophlebitis.

The *Bacillus bipolaris septicus*, and the *Bacillus coli communis*, seem responsible for the presence of this disease. They gain entrance to the umbilicus at birth or when the cord is ruptured. In some cases, it is thought the organisms have entered the circulatory system before birth. It is not such a common disease in lambs as in the foal, but outbreaks occur from time to time.

Symptoms: The disease is very easily recognized, for the symptoms are very pronounced and characteristic. The lamb becomes "dumpish" and dull. It has no appetite, and the temperature per rectum will be found to be very high, often

107 degrees Fahrenheit. The stump of the cord assumes a purplish color, and Wharton's jelly becomes tinged with pus. Sometimes, the joints become enlarged. Later, a copious diarrhea sets in, followed by an intense cachexia and death.

Treatment: Where a number of lambs are affected, the logical thing to do, of course, is to remove the whole band to another place, and, if the weather be suitable, to allow the ewes to lamb in the open.

The pus may be squeezed out of the umbilicus of the affected lamb and hydrogen peroxid injected, to be followed by tincture of iodine, turpentine, chinosol, pix-cresol, lysol, or any of the coal tar preparations. Carbolic acid is not as good as other less coagulating antiseptics. Oil of eucalyptus is excellent.

Internally, the lamb may be given twenty grains of the triple sulphocarbolates mixed in a raw egg, three times a day. A tablespoonful castor oil is also beneficial to correct the weakening diarrhea. Stimulants, antiferments, intestinal antiseptics and tonics, such as echinacea, all have their use.

The chances of successful treatment in lambs that show the typical symptoms are not very good, and a grave prognosis should be given. In the treatment of valuable animals, bacterins may be used.

5. Non-Contagious Diarrhea.

This is usually due to some disturbance of the mother's health, or to the decomposition of food in the stomach of the new-born. Chills, cold,

dampness and milk that is too rich are also common predisposing factors. If not checked, it runs a rapid, fatal course, therefore prompt treatment is essential.

Treatment: The exciting cause should be determined, if possible, and removed. Administer to the ewe a tablespoonful sodium hyposulphite twice daily. Milk out the udder thoroughly. Feed her nourishing food, such as bran and oats.

The lamb may be given a tablespoonful of castor oil, to which is added a raw egg and twenty grains of triple sulphocarbolates. Salicylic acid, five grains, in condensed milk, is highly recommended. The following prescriptions have given good results, when preceded by an intestinal anti-septic and castor oil:

R

Tr. ginger.....	3i
Creosote, beechwood	mv
Dioscorea, Flect	3ii
Fresh milk.....	3iv

M. Sig. Give in two doses, one hour apart.

R

Tr. euphorbia	3ii
Creosote	mv
Spts. camphor	3ii
Elix. lact. pepsin q. s. ad.....	3ii

M. Sig. Give in two doses two hours apart.

6. White Scours.

Infectious diarrhea; dysenteria neonatorum.

This disease is caused by the *Bacillus coli communis*, a small, thick, rod-shaped, motile, non-spore-forming organism, not staining by Gram's method, but with the aqueous anilin dyes. Other

germs are thought to cause or assist in the infection.

Symptoms: Newborn lambs, a day or two old, seem to be the usual victims. The lamb becomes dull; loses its appetite, and the feces passed at the first are a bright yellow, later, a foamy, greyish-white. The wool is matted, and streaks of mucus are found on it. In a short time, the lamb becomes very weak; the eyes grow glassy, and the victim drops to the floor and dies in a stupor.

The temperature is about normal, and, as death approaches, drops to subnormal.

Treatment: This is not a common disease of the range, but is usually found in low, marshy pastures, or sheds which contain the infection. The logical treatment is to isolate all the apparently healthy lambs, and give the sick ones intestinal antiseptics—a drop of formalin, in a little milk, or sulphocarbolates. The immediate slaughter of those hopelessly affected is advised. Immunization with bacterins may be tried where the stock is valuable. Prevention is the best method to pursue and the most satisfactory to all concerned.

7. Colic.

“Stretches”; belly-ache.

Considered under the section on Diseases of the Digestive System, page 116.

8. Constipation.

Costiveness.

For further treatment see page 115.

9. Pustular Eruption of Lambs.

This is a rare but fatal disease of lambs.

Symptoms: These resemble those of foot-and-mouth disease very closely and experience is required to differentiate. It seems to be contracted from a form of gangrenous mammitis in the ewe, and is very infectious.

Treatment: Mainly quarantine and segregation of the infected. The ulcers on the lips of the lambs and the udders of the ewes may be painted with silver nitrate.

10. Tetanus.

This is very prevalent on the western range, following castration, docking and ear marking. It has been considered on page 92 in the section on Acute Infectious Diseases.

11. Stomatitis.

The sporadic form is known as "sore mouth" or thrush among sheep men. The contagious form, known as "necrotic stomatitis."

Symptoms: This condition is so difficult to distinguish from foot-and-mouth disease, that no one should take any chances; if the *history* will justify the supposition that it may be the latter, notify the nearest representative of the Federal Bureau of Animal Industry by wire.

The simple cases are treated with mild antiseptics, such as boric acid, or weak tincture of iodine.

SECTION XIX.

DISEASES OF THE EWE.

In the western sheep raising sections it is remarkable how small the loss is among breeding ewes. This is largely due to constant culling out the ewes that prove to be poor milkers, or that have difficult parturition; those subject to mammary troubles, and those that lose their lambs. It is a "survival of the fittest" with breeders aiding nature in the selection. Coupled with this is the active life that the ewes lead during pregnancy.

The small bands of sheep, kept under artificial conditions, are the commonest victims of this class of disorders. Lack of exercise, with rich, concentrated foods, play an important part in predisposing to this as to other diseases. These factors, combined with exposure and spoiled forage, are by far the greatest hindrances to success with pregnant ewes. The man who cannot, or will not, recognize these should retire from the sheep business, or, better still, never embark in it.

1. Disorders of Gestation.

Eliminating spoiled forage or bruises that cause abortion, very little trouble is met with in the pregnant ewe.

2. Abortion.

Three types are recognized, the first one being the most common:

Sporadic or accidental, due to some injury or the ingestion of mouldy food. Upon a careful examination of the food for evidences of mould, ergot, pitch or other toxic ingredients, the cause will usually be found. The treatment is removal of the exciting cause. Large doses of intestinal antiseptics or viburnum prunifolium are indicated in those threatened with abortion, together with clean, laxative food and absolute quiet.

Enzootic abortion, due to some infectious disease, such as blackleg, scab, pneumonia or rabies.

Contagious abortion. This is so rare among sheep as to merit but little attention. When this does occur, quarantine measures constitute the only successful means of prevention known. The symptoms are similar to those of contagious abortion in the bovine.

3. Dystocia.

Difficult lambing; difficult parturition.

Usually seen in young ewes lambing for the first time, and is due in the majority of cases to a pair of lambs entering the pelvic channel at the same time. They become tangled up in such a way that the most painstaking skill is required to "unravel" them.

First, restrain the ewe in such a manner that she will be powerless to strain. This may be accomplished by two assistants elevating the ani-

mal by holding the hands under the flanks. Have the animal face a corner so she cannot creep away on her front feet.

With the fingers cleansed and disinfected, form them into a cone. For a lubricant as well as a deodorant, one part of oil of eucalyptus in sixteen parts of raw linseed oil is very good. If the lambs are dead, injecting a lysol solution into the vaginal cavity will mask the odor. Repel the lambs, and lubricate the vaginal canal thoroughly. Now rotate one lamb until as near a normal presentation as possible can be obtained. A small piece of twine or rope can be attached to the feet, and with traction exerted slowly and carefully, the lamb may be pulled out.

When the lambs are taken away, the uterus may be flushed with a good antiseptic solution, and the ewe let down. If she is very weak, a stimulant should be given, and a warm blanket thrown over her. Many a valuable ewe can thus be saved. Unfortunately the veterinarian's fee for services in cases like this is ordinarily more than the animal is worth. This low value of the ewe is the greatest hindrance to the handling of parturient cases in sheep. Under certain circumstances it might be well for veterinarians to make some special arrangements, as to charges for this work, with the owners of bands where a large number of ewes are to lamb at about the same time.

4. Decomposition of the Fetus.

In many cases a veterinarian is called upon to pass judgment as to whether or not a ewe is preg-

nant, and, if so, if the fetus is alive or dead. In some instances, this is a very puzzling question.

In situations where the soil is highly impregnated with limestone or other mineral salts, one should always guard against the mistake of looking for a vaginal or fetid discharge in case of a dead fetus. Mummifications are often present under such conditions, with not a single external symptom visible.

When a ewe has a fetus die within her, and barely pulls through the ordeal with her life, it is a good plan to advise fattening for the market. Adhesions often prevent future normal parturition.

In cases of putrid fetuses in the uterus, flushing out with strong antiseptics and deodorants, and a small capsule containing twenty grains of potassium permanganate and several drams of boric acid may be introduced into the uterus with advantage.

The udder should be attended to, for a violent mammitis, commonly known as "blue bag," may take place. Milk out the udder and apply belladonna ointment.

5. Displacement of the Uterus.

The common term for this ailment is "down-fall of the lamb-bed," which includes all the ailments of the womb from the layman's standpoint.

Three serious conditions may affect the uterus:

- (a) Hernia or rupture of the prepubian tendon.
- (b) Torsion or twist of the uterus when pregnant. Fairly common in the ewe.

(c) Deviation of the uterus or complete eversion.

Very little can be done to alleviate these conditions. As a rule, they are too far advanced to be treated when expert assistance is called.

6. Eclampsia.

Milk disease; milk sickness.

Under this heading is considered parturient paresis, corresponding to the condition of the same name in the cow—the well known “milk fever.”

Symptoms: After a normal parturition, and suckling the lamb, the latter dies or is taken away. Within a day or two the first symptoms appear. There is loss of appetite and rumination. The ewe ceases to mourn the loss of her young, and the eyes grow glassy. Coma takes place, and the characteristic symptoms of milk fever in the cow are present.

Treatment: This must be given promptly, and no medicine must be administered by the mouth. One dram of chloral hydrate well dissolved in lukewarm water may be given as a rectal injection, or one-eighth to one-fourth grain morphin given hypodermically. Atropin, in one-tenth grain doses, may be tried. Inflating the udder, if at all possible, should be tried.

7. Metritis.

Inflammation of the womb or uterus.

When this condition occurs, uterine injections of antiseptics, stimulants and blood tonics should

be given. There is very little satisfaction in treating this condition, since, due to previous neglect, the case is usually hopeless at the time the veterinarian first sees it.

8. Mammitis.

Inflammation of the udder; blue bag; caked bag; mastitis.

A rather common ailment in the spring among a band of ewes.

The common treatment is to slash the udder open with a knife, and, if the poor ewe lives through this, to fatten her for the market. By humane methods and a little missionary work, much suffering among ewes may be averted by the veterinarian.

Dissolve a half-pound Epsom salt in a quart of hot water, add an ounce fluid extract phytolacca to this solution; place the animal on her back, and with flannel or cotton, dipped in the solution, apply to the udder. In a few minutes the change will be remarkable. Bathing the udder with the warm solution seems to relieve the intense inflammation. If the lamb is alive, allow it to suckle, as the bunting seems to massage the udder and aid in its restoration to normal. A tablespoonful of the phytolacca may be administered twice daily for several days with benefit. If the lamb is dead and the ewe is to be dried up, belladonna ointment or camphor and lard should be applied.

9. Abnormalities of the Milk.

This is not a common condition among ewes. It is not so important as with the dairy cow. Still,

one is often asked about these questions, and the following is given for information:

Agalactia or absence of milk. This is a symptom, and one of the first symptoms of disease in a milking ewe. A form of infectious agalactia has been observed among ewes and goats. It is of unknown origin.

Watery milk. This is due to an absence of fats and casein; the milk is of a bluish color. By changing the food and administering tonics, the condition may be improved.

Fatty milk. This is found among ewes that have been fed on rich, concentrated foods, such as oil cake, and in ewes suffering from lack of exercise. Diarrhea ensues among the lambs. The treatment is less food, more exercise and an abundant supply of water.

Curdling milk. A symptom of indigestion, mammitis, poisoning, overheating, and of advanced pregnancy. To alleviate this condition, a tablespoonful of sodium hyposulphite may be given once daily.

Fermenting milk. Cause and treatment same as above.

Putrescent milk. Caused by an invasion of bacteria in the udder. Treatment is the same as for curdling milk, or fattening for slaughter.

Slimy, stringy and soapy milk. Caused by fungi and bacilli. Rather rare. Treatment similar to that for curdling milk.

Blue milk, due to the *Bacillus cyanogenus*.

Red milk, caused by the *Bacillus prodigiosus*.

Yellow milk, caused by the *Bacillus synxanthum*.

Foreign matter, such as dirt; abnormal taste, arising from certain foods, as carrots; drugs, as turpentine and asafetida; germs, such as are found in gangrenous mammitis, and blood, may all exist in milk.

10. Sterility.

A long scientific treatise on sterility in the ewe would prove not only impractical but tiresome. The common and best method is to fatten all ewes that prove to be non-breeders. Due to the small vaginal canal of ewes, manual examinations are difficult to make, and even when made often nothing abnormal can be noted in non-breeders.

SECTION XX.

DISEASES OF RAMS AND WETHERS.

1. Gravel.

Urinary calculi cause serious disturbances in rams and wethers, due to the very small caliber of the male urethra, which is only one-sixteenth of an inch in diameter. It has been noticed that the extensive feeding of sugar beets and mangels will cause gravel, and many animals have been lost from this disorder.

Symptoms: The manifestations of this ailment are very pronounced, though rather hard to differentiate at the onset. There is sudden loss of appetite; colicky symptoms, with an urinous odor on the breath. Unless slaughtered, the animal soon dies.

Treatment: Prevention is chiefly to be sought. Mixing a little sodium bicarbonate with the food several times a week is beneficial. Withhold sugar beets or mangels from male sheep.

2. Hernia.

Rupture in sheep usually is not diagnosed until after death. It is a rather rare but fatal condition. Only in valuable animals is an operation advisable.

3. Bloody Urine.

This condition is merely a symptom of some primary ailment, such as arise from injuries, gravel, poisons, roots or mouldy silage.

Treatment: Symptomatic treatment is about all that can be given. It must be aimed at the causative factor. Whole flaxseed jelly in teaspoonful doses given in bran and oats is soothing to the urinary organs.

4. Impotence.

Sterility in the ram usually means fattening for market, as it is not profitable to experiment with a sterile ram. Sometimes finding this out is rather expensive, and it is a good plan to "try" several ewes in heat early in the season before turning the ram into the flock.

It is commonly due to lack of exercise. Range bucks for this reason suffer but little from this condition. Medicinal treatment, if attempted in a valuable animal, must be subordinated to exercise to achieve any results. Damiana or yohimbin in small, repeated doses, together with nourishing, but not too concentrated food, may be beneficial.

SECTION XXI.

SURGICAL DISEASES.

Surgery in the sheep has been of the "rough and ready" sort, to which the patient was as likely to succumb as to the original disease or ailment. Another thing, the value of the animal, except in the case of pure-bred animals, has never been enough to justify expert assistance.

The sheep, like the ox, is very resistant to pyogenic infection, and if in good condition soon recovers from surgical interference when this is done in a skillful manner.

1. Diseased Teeth.

Often supernumerary teeth are found that interfere with rumination and cause the adjacent teeth to decay. Extraction is indicated, and can be performed with a small pair of "wolf tooth" forceps.

2. Concussion of the Brain.

This is comparatively rare, taking into consideration the chief method of defense is butting. On the western range, many cases are seen among lambs in the mountainous district, caused by rocks rolling down the mountainside and hitting them on the head.

Symptoms: More or less vague, unless one knows the history of the case. The animal seems

in a stupor, while the respirations are small and rapid. Later, the animal becomes weak, assumes a staggy gait, and paleness of the visible mucous membranes is noticeable.

Treatment: Medical interference in these cases is contraindicated, for a drench will enter the lungs. Dashing cold water on the head, and allowing the animal perfect quiet is about as good as any treatment known.

3. Abscesses.

Abscesses are rare in sheep, but sometimes may follow shearing. Curetting and irrigating several times with a mild astringent antiseptic, such as one dram potassium permanganate and two drams powdered alum to four ounces of water, is a beneficial treatment.

4. Injuries.

These consist mostly of bruises caused by shipping or crowding, or by predatory animals.

Often the animal is injured far more seriously than external indications show, and with the best treatment dies from some internal disturbance.

Dressing the injury with tincture of iodine and applying a dry dressing, together with a stimulant, is about all that can be done.

5. Suturing.

Very rarely performed in sheep, although in lacerated wounds such as animal bites, it may be satisfactorily done. With the muscles and skin brought into apposition and held there healing will take place much earlier than otherwise.

6. Rumenotomy.

Removal of the contents of the rumen or paunch.

This is rarely performed although it has saved the lives of many bloated sheep.

Textbooks give elaborate directions for performing this operation, but in actual practice if one were to follow them out, the majority of sheep would be dead before the contents of the paunch were removed.

If there is time, an area the size of a man's hand on the left flank should be clipped, and tincture of iodine applied. An incision, running parallel with the last rib, and several inches long is then made. The contents are removed as rapidly as possible, the walls of the paunch sutured, and the skin brought into apposition with several interrupted sutures. Tar is smeared over the wound, and in several days the skin sutures removed.

Sheepmen not infrequently perform this operation with a pen knife and a piece of string for suturing material, and even under these conditions the operation often proves successful.

7. Puncture of the Bladder.

Frequently bucks and wethers are troubled by urinary calculi, which sooner or later close up the urethra and prevent the passage of urine. Surgical textbooks give elaborate procedures in these cases, but after one has tried it several times on sheep he will desist. So many animals "die getting well" that it does not give the operator any credit.

8. Fractures and Dislocations.

It is remarkable how few broken limbs or even dislocated joints occur among sheep. Grazing on precipitous cliffs that defy any human being to climb, jumping across narrow ravines, or even running headlong down a steep bluff, few accidents occur, and these are usually among lambs.

The treatment of fractures in lambs is simple. First, dust boric acid or talcum powder over the affected part. Apply an inch layer of cotton, over which lay half a dozen wire or wooden splints after adjusting the ends of the bones. Bind with gauze bandage, not too tight, allowing for future swelling. The lamb can be carried along in the camp-tender's wagon, for several days, and it is amazing how soon it recovers the use of the limb.

Dislocations, sprains, bruises and twisted joints are rather difficult to treat, rest being the most important factor. Applying saturated solutions of magnesium sulphate, and later, a solution composed of two drams fluid extract belladonna and one dram lead acetate in half pint of water, will often prove beneficial. Sometimes iodin compound ointment is as good as anything. Blistering medicaments are not indicated.

9. Amputation of the Claws.

This is often necessary in foot rot, and consists in cutting away the diseased part with a sharp knife. Tincture of iron, creolin, balsam of Peru or any good antiseptic can be smeared over the part. The balsam of Peru gives splendid results, but is rather expensive for sheep.

10. Panaritium.*Canker of the foot.*

Sometimes brought on by bruises and the consequent infection by the bacillus necrosis. Other times by excessive damp weather and ranging in low, marshy pastures.

The treatment is largely hygienic; removal from the damp or infected quarters, and driving through a trough containing several inches of blue vitriol solution—one pound to five gallons of water, or even stronger. In very severe cases, one dram of formalin to two ounces of glycerin, or a paste composed of equal parts of flour and chlorid of zinc, may be applied with much benefit.

SECTION XXII.

PARASITIC DISEASES.

Experienced men will corroborate the statement that more sheep are lost from invasions of parasites than from all other causes combined, with the possible exception of digestive disorders. Before the days when scab was under control, parasites were, even more than at present, the scourge of the sheep business.

Sheep seem to have very little power to resist these pests, and when once infected, not only succumb but spread infection among others. In many instances, the vitality is so lessened by parasitic invasion, that although death does not result, little gain is made in weight or wool because of the devitalizing effect of the parasitic infestation. The animal is in a fit condition to be carried away by trivial diseases, that in perfect health would be resisted with little trouble.

It is of the greatest importance in this class of diseases to quickly discover the inciting cause. This is most vital; treatment of the infected individual or individuals being secondary. Stockmen do not care for finely spun theories or for prolonged scientific explanation of the probable cause of an epizootic among their flocks; they do not appreciate the beauties of science, and care little for the life-history of the pest. What they most earnestly desire and are willing to pay

for, is final results. The time to explain how to prevent a recurrence of the trouble is after the epizootic has been brought under control or eradicated.

In the sheep raising section on the western range only five parasites are common; two external, the common scab mite and the sheep tick; three internal, the stomach worm, the liver-fluke and the "gid" or "turnsick."

A. EXTERNAL PARASITES.

1. Sheep Scab.

Common scab; mange; itch; scurf; St. Anthony's fire; wildfire; erysipelas; dry scab; dry rot, and ringworm.

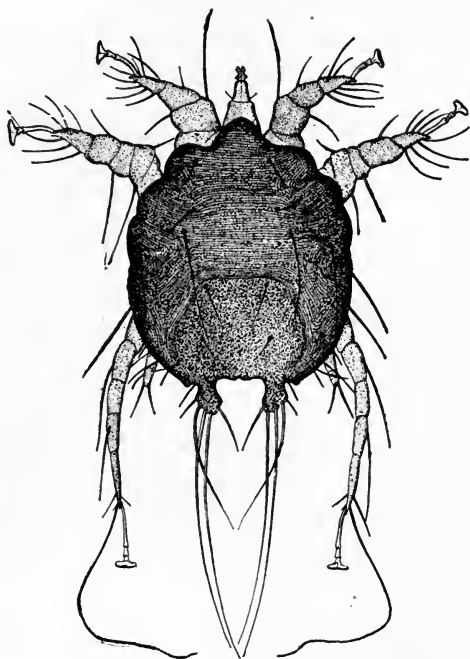
Sheep scab is caused by the *Psoroptes communis ovis*; order Acarina; class Arachnida.

The scab mite is a nearly round, rather light colored parasite, the female measuring about one-fortieth of an inch in length, and the male nearly one-fiftieth. By placing the mites on a sheet of black carbon paper and holding this in the sunlight, they can be seen easily.

After mating, the female deposits about a dozen eggs at the base of the wool fibers. These eggs hatch in three or four days; in a week the young will have matured, and in three or four days more they will have mated and the female laid her eggs. Gerlach estimates that the entire life cycle of the psoroptes mite is completed within fifteen days. Using these figures as a basis for calculation, it has been estimated that

the progeny of a single pair of mites may attain to the astounding number 150,000,000 in about four months!

Symptoms: To the experienced, the symptoms of scab are very plain. When a sheep becomes



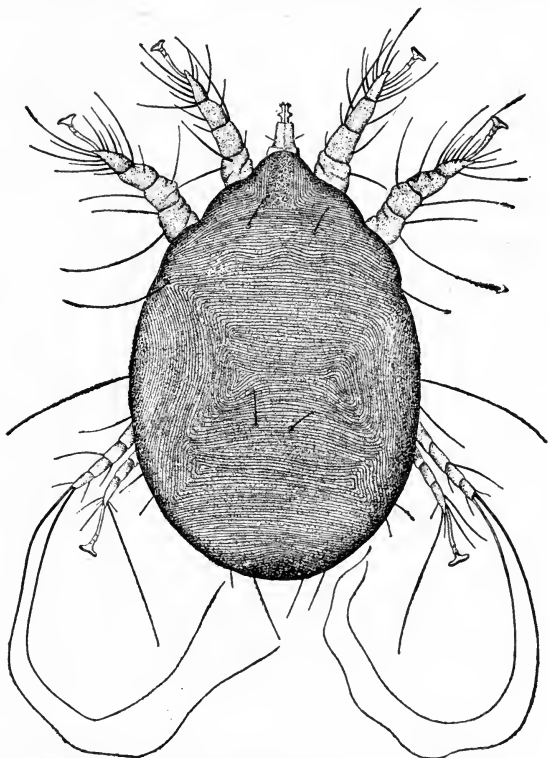
SHEEP-SCAB MITE (*Psoroptes ovis*). Male.

Dorsal view greatly enlarged.

(After Salmon and Stiles, 1898.)

infested with one or more mites, small inflamed zones occur where the mite pierces the skin to obtain food. This is followed by itching and the formation of papules, and, as the mites multiply in numbers, the area of inflammation rapidly

increases. Serum oozes from the papules, and it is in this stage that the disease is first noticed. When bedded down, the infected animal will get



SHEEP-SCAB MITE (*Psoroptes ovis*). Female.
Dorsal view, greatly enlarged.

(After Salmon and Stiles, 1898.)

up and bite or rub its body against another or some tree or post.

The wool begins to get "taggy," and soon commences to fall out. Crusts form on the skin from the dried exudate. It is under the crusts that the mites live.

Depending on the severity of the infection, the disease progresses until the animal never seems to be at rest. It becomes thin; the wool falls out in patches usually along the flanks and back; larger and larger areas of the skin become inflamed and covered with crusts; others become infected, and soon the whole band is one rubbing, biting, scratching mass of distracted sheep.

Differential diagnosis: Practically the only way to become familiar with the disease is to see a genuine case. After this, the rest is comparatively easy.

Wool that has fallen out due to "blue bag" in ewes, or to exposures, leaves a soft, normal skin. There is nothing but a "bald spot" with no pimples, vesicles, papules or inflammatory zones.

Eczema of the various types merely shows a reddening of the skin without the thickening that accompanies "scab."

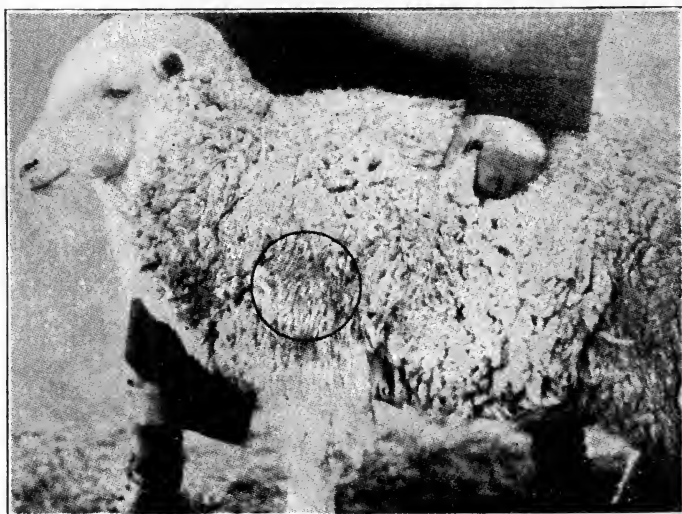
In sheep work it is always safe to think of scab first, in suspicious cases, and to act accordingly. This will protect the veterinarian and the owner, even if it does put the latter to a little inconvenience.

Treatment: As is well known, dipping and quarantine have nearly eradicated this disease from our country. The subject of quarantines has been taken up in the section on Federal and State regulations.

Dipping with "lime-and-sulphur" has been the mainstay on the western range, the official dip being prepared as follows:

Unslaked lime.....	8 pounds
Flowers of sulphur.....	24 pounds
Water	100 gallons

The lime should be placed in a water-tight box or large bucket, and sufficient water added to make a thin paste. Sift the sulphur in slowly, mixing lime, until the lime and sulphur is about the consistency of mortar. A kettle with 30 gal-



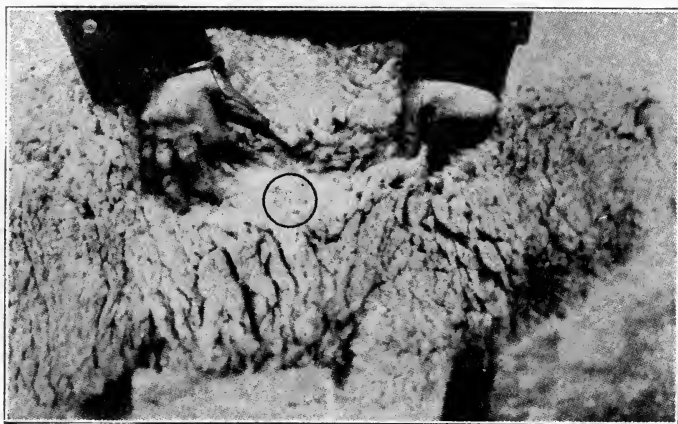
First stage of scab on shoulder, showing natural position of wool disturbed by biting and scratching.

U. S. Dept. Agr. Bul. 713.

lons of water now receives this paste, and it is boiled for two hours. Water should be added to keep the total quantity up to thirty gallons. It should be stirred well with a mortar hoe, while boiling, to keep the paste from caking on the bottom of the kettle. After boiling for two hours, this "concentrate" should be placed in a barrel

to settle, with a bunghole four or five inches from the bottom. If the sediment be mixed up in the dip it will injure the wool, or may harm the eyes of the sheep.

When ready to dip, draw off this clear liquid from the settling barrel into the dipping vat, and add 70 gallons of water, warmed so that the



LEGEND—Characteristic scab lesion in early stages of disease.
U. S. Dept. Agr. Bul. 713.

whole mixture is about 100 to 103 degrees Fahrenheit, or in warm climates, several degrees higher.

The size of the dipping vat should depend upon the number of sheep to be dipped and as minute directions for the whole operation are given in government regulations, this phase of the subject need not be taken up in detail here.

In dipping sheep each one is ducked "head under" once, and kept in the solution for at least two minutes.

In cases where the scabs are extensive, "hand-dressing" should be done to soften the crusts.

There are a thousand and one methods of making up the dip and procedures in dipping. In actual practice one soon learns to make the best of facilities at hand, and forget the specific in-



LEGEND—Scabby buck with entire hindquarters and flank affected. The discolored area is due to dip stain from hand dressing.

U. S. Dept. Agr. Bul. 713.

structions laid down by some person who has possibly never been within a thousand miles of a real sheep camp. The man who is ingenious along these lines, and who can "get along" with the sheep men, is one of the most valuable assets that the Federal or state governments can possess. Unfortunately, merit has been little recog-

nized by either, and officials who have done nothing but antagonize the rank and file of sheep men are kept in localities year after year where their usefulness is greatly impaired if not actually lost. This is one reason why so much enmity exists upon the subject of "scab."

When ticks are present with the scab mites, the tobacco or nicotin dips are probably preferable, for they exterminate ticks better than lime-and-sulphur. These are made up in several different formulae, two of which are given:

Tobacco	30 pounds
Sulphur	7 pounds
Concentrated lye	3 pounds
Water	100 gallons

Steep the tobacco in warm water for about a day, pour off the solution, and add the sulphur, lye and water sufficient to make up 100 gallons. Stir while using, taking the same precautions to keep the dip warm as with the common lime-and-sulphur dip.

The nicotin dip is made up as follows:

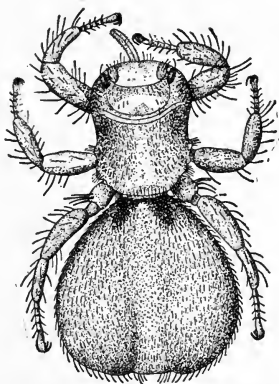
Nicotin	Four-tenths of a pound
Flowers of sulphur	16 pounds
Water	96 gallons

Mix the nicotin and sulphur together in a quantity of warm water, and add to the rest of the water in the dipping vat. Keep a close watch on the evaporation, as it may become too strong.

The nicotin solution found on the market contains a statement on the package of the amount of absolute nicotin, and the correct amount to make up the above can easily be figured out from this basis.

In making up dips one should take into consideration the severity of the infection; the state of weather; the kind of sheep; the hardness of crusts, and the facilities for dipping and heating the water. This requires judgment and experience.

The sediment from the dipping vats is usually diluted and thrown around the corrals or pens as a disinfectant.



SHEEP TICK (*Melophagus ovinus*). Male. Dorsal view, enlarged.

(From Curtice, 1890.)

Many other dips are used with good success. Coal tars, arsenicals, carbolic acid, potassium sulphid and patent dips are all on the market. Since the war, the prices of certain chemicals have so risen that the old lime-and-sulphur has gained somewhat in popularity.

To eradicate scab from a band of sheep, every member of the flock should be dipped two or three times; kept under close supervision, and at the least symptoms of its recurrence, re-dipped.

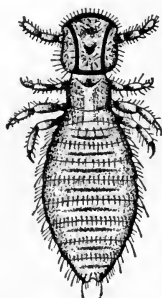
The vitality of the mite egg or the mite itself is exceedingly great, although the exact length of life is unknown. However, it is not considered good policy to drive sheep into a corral or pen that has been infested within a year.

2. Head Scab.

Sarcoptes scabiei ovis.

This is the smallest of the three varieties of scab mites. It usually burrows under the skin around the nostrils first, causing small light pimples. The sheep scratches its nose as though infected with the "grub."

This is not a common disease, and "hand dressing" with any good dip will usually clear up the trouble.



SHEEP LOUSE
(*Trichodectes
sphaerocephalus*).
Adult female,
enlarged.
(After G. Neumann,
1892.)

3. Foot Scab.

Symbiotes scabiei ovis.

These are rather large mites, and cause irritation on the feet and legs. The symptoms are biting and stamping, with crust-like formations.

This malady is a rare one, and is treated by applying a lather of soap-suds or olive oil to loosen the crusts, and then scrubbing with a ten per cent. solution of creolin.

In all forms of scab, of course, the pens or corrals must be disinfected, if the work be done during the winter season.

4. Sheep Ticks.

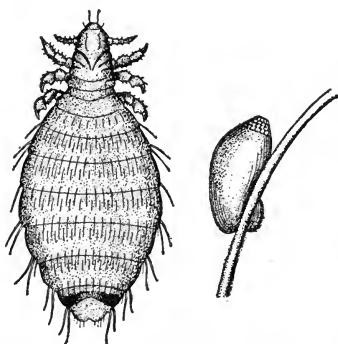
Melophagus ovinus.

This is a six-legged, brownish-colored, mottled parasite, resembling a wingless fly. It spends its entire life on the sheep, the female laying

about fifteen eggs, which hatch in about three weeks, the exact period depending somewhat on weather conditions.

While not so destructive as the scab mite, the tick causes a great deal of damage by blood sucking, in lambs, often stunting the growth.

It is not an essentially infectious parasite, as it prefers to stay close to its old home.



SHEEP FOOT LOUSE (*Haematopinus pedalis*). Adult female and egg, enlarged.
(From Osborn, 1896.)

Swingle of Wyoming found a sheep can be kept free of ticks by keeping a three-foot partition between it and infected animals.

Coal tar or tobacco dips are recommended to eradicate this pest, and two dippings, two days apart, will usually clear up the trouble.

It is the common procedure in the western states to dip the animals after shearing; this is not only beneficial to the fleece but rids the animal of ticks, lice and fleas, as well.

In the west the ticks are very numerous on the sheep in the spring, but after shearing they leave the older sheep and are found principally on the lambs. Later, when the whole band are driven up in the mountains for summer range, practically no ticks are found at all in the band. During the winter they become numerous again, and do an incalculable amount of damage by sucking the blood and causing a constant irritation.

5. Lice.

Trichocephalus sphercephalus; common sheep louse.

This is a very small white and reddish brown parasite, measuring about one-twentieth of an inch in length. The eggs are laid at the base of the wool fibers.

Only a very careful examination reveals the true cause of the irritation, as the symptoms are much like scab. In the heat of the day, the lice will be found to be sticking to the outer end of the wool fiber.

If many animals are infected dipping with any coal tar dip is advisable. If only a few, an ointment composed of equal parts lard and sulphur, rubbed into the affected parts, will soon eradicate the lice.

6. Maggots.

Embryo of the Musca vomitorium or common blow-fly.

This is one of the most serious pests with which the sheep man has to contend. When a sheep is accidentally cut during shearing, or receives some other injury breaking the skin, the blow-fly attacks the helpless animal. Sometimes the wool becomes overlaid with fetid discharges such as urine, feces, or pus, and here the fly lays her eggs. Soon a festering mass of maggots are present, and which in a large band are often not discovered until the animal is nearly dead.

The treatment consists in getting the maggots out of the sore, and painting the edges with tinc-

ture of iodine. As turpentine is a common household remedy, this may be used. A little ether mixed with sweet oil has a tendency to bring out all maggots that are deeply buried. Solutions of creolin are useful, or even coal oil (kerosene) may be used.

The best thing is prevention. In case of injuries, smear pine tar over the part, or equal parts lard and sulphur. All taggy wool should be clipped.

7. Fleas.

Pulex irritans [human]; *Pulex serraticeps* [dog]; *Pulex avium* [bird].

These rarely attack sheep. It is sufficient to merely draw attention to their existence. In certain localities, however, they are very prevalent.

Dusting the animal well with Persian insect powder and disinfecting the pen or corral with creolin or lime will eradicate these pests.

8. Flies.

Under this heading come gnats, sandflies, mosquitoes and other winged parasites. Flies of peculiar economic value to the sheep industry, such as the *Musca vomitoria* (adult of the maggot) and the *Estrus ovis* (adult of the grub in the head), have been considered at length under their respective headings.

B. INTERNAL PARASITES.

Fortunately, due to the high altitude of the common sheep ranges in the west, very few in-

ternal parasites attack sheep. Only in isolated localities are these found, and then usually in low sections of the country, or in places long devoted to sheep husbandry.

1. Gid.

Sturdy; turnsick.

This ailment is due to the larva or hydatid phase of the tapeworm, the *Taenia coenurus*.

The eggs of this tapeworm are distributed around the pens or corrals by carnivorous animals, chiefly dogs. Other animals, such as the coyote, wolf or fox, may also be the host of this tapeworm.

After the eggs are ingested by the sheep, it is supposed that they hatch and the embryos gain entrance to the circulatory system by piercing the walls of the stomach, although our knowledge of their life history is incomplete. Those that reach the brain or spinal cord develop into large cysts, and cause this fatal malady among sheep.

Symptoms: The manifestations of gid are general in character, and at first one may suspect rabies, or some form of poison, but the coma that soon follows, and an autopsy, will reveal the true cause. The animal becomes dull, with loss of appetite. Later, it begins to stagger around in more or less of a circle, hence the old



a



b

ESTRUS OVIS.

a. Adult female.

b. Adult male.

name, "turnsick." Finally, it falls down and dies in a convulsion.

The fact that there is no sneezing or nasal catarrh in gid differentiates it from grub in the head.

Treatment: This is unsuccessful, prevention being the only logical method to pursue. Treat the sheep dogs with a vermifuge, such as the following:

R	
Pulv. areca nut.....	gr. xx
Male fern	3i
Turpentine	m. x
M. f. cap.	

Starve the dog all day, allowing plenty of water. In the evening, give the above, and the next morning administer four tablespoonfuls castor oil. Do not allow the dog to run over the sheep pasture. This is the average dose for a forty pound dog. Stray dogs are best treated with lead administered with a well aimed gun.

Where sheep are known to be infected, all heads of dead animals should be burned and not fed to the dogs or left for coyotes.

2. Grub in the Head.

Grub; gleet; nasal catarrh.

Cause: The sheep bot-fly, *Estrus ovis*, deposits living larvae in the nostrils of sheep. These crawl up into the nasal cavities, causing a violent catarrh, and, in severe invasions, death. Loss of weight and lack of thrift always occur. In some localities, they are a very serious menace.

Symptoms: These are very pronounced. The infected animal runs around snuffing as though it had something in its nose. The rest of the band keep their noses close to the ground and show signs of fear. Later, the infected sheep lies down, sneezes, rolls its head in every conceivable shape and exhibits the greatest of excitement. The eyes grow watery while the nasal membranes are inflamed.

To differentiate from gid is comparatively easy. There is no violent staggering around in a circle, and no disturbance of the functions of the nervous system, the nasal catarrh being the most prominent symptom.

Treatment: After infection, this is practically hopeless. Some good results have been reported by mixing snuff in olive oil and pouring it in the nose, while holding the victim on its back. Wire snares formed of small loops have also been tried.

Prevention is the only logical procedure. Keep the nose well smeared with tar. In a large band, this is done by boring large holes in a plank, smearing the edges with tar, and filling up with salt.

3. Lung Worms.

Hoose; husk; snots; verminous bronchitis.

The *Strongylus filaria*, a small, reddish-brown round worm, less than an inch long, and about as thick as a thread, is the parasite responsible for this disastrous disease.

The life history of this worm is not exactly

known. According to some investigators, the worms deposit their ova in the air passages of the infected animal, and the embryos are expelled either through the sneezing of the animal, or through the feces. They can live in several intermediate hosts, such as the angleworm, and when a sheep or a lamb eats or drinks in the infected locality, the parasite reaches the air passages. Here again they pass through another life cycle, which is repeated with startling rapidity.

Symptoms: The evidences of this ailment are most pronounced in lambs, and depend upon the number of parasites present. First, there is a pronounced anemia, commonly known as "paper-skin." A broncho-pneumonia is next seen, accompanied by a short, hacking cough. The nose is rubbed on a log, and the victim breathes with difficulty. Toward the last, a diarrhea sets in, and the animal staggers around, until it falls to the ground, never again to rise.

Treatment: This is useless when the lungs are infested, or the disease in the last stage. If the worms are in the trachea, one dram of gasolin may be injected intratracheally.

Prevention is far more satisfactory than treatment of affected animals. Separate the healthy from the sick, and keep on high ground. Infested pastures should not be grazed for a year or two. The disease is seen at its worst in the fall, following a wet summer.

4. Stomach Worms.

This is one of the most serious ailments that affect sheep, especially is it serious in the young.

Another member of the Strongyles, the *Strongylus contortus*, a brownish colored thread worm, is the cause of this ailment.

The life history of this parasite has not been worked out definitely. It is the common supposition that the ova are voided by in the feces of the infected animals; other sheep pick them up on the grass or in the water, and thus spread the infection.

This parasite prefers a cool, damp habitat, and experienced observers have pointed out the fact that the infection is usually acquired around shade trees where the lambs play during the heat of the day. On desert ranges, in sandy or volcanic ash soil, very little trouble is experienced.

Symptoms: The experienced eye will easily detect the symptoms of this disease. Along in July or August, the infected animal begins to hang back from the rest of the band. "Off color," says the herder. Emaciation becomes noticeable, and the walk is hesitating, like a sick person getting out of bed and taking a first few steps. The wool becomes harsh and rough, and the lamb becomes very weak. Later, the victim staggers about, keeping from tumbling on the ground by the greatest of efforts. A swelling comes on the lower jaw, just between the angles of the inferior maxillae, while the visible mucous membranes are pale, and the skin like parchment. Depend-

ing on the severity of the invasion, death may take place in from two weeks to two months.

A postmortem examination reveals the presence of clumps of reddish-brown worms, about half an inch long, and size of a hair, living in a brown liquid, in the lower part of the fourth stomach or abomasum.

Treatment: In a small band of sheep, treatment can be instituted with a fair degree of success if started in time. Segregate all suspected cases and keep them in a corral. Drive the apparently healthy ones to another pasture, preferably a high and dry one. Keep all food away from the ones to be treated for a whole day, allowing plenty of water. That evening give to an ordinary lamb one-half ounce each of gasolin and raw linseed oil, to which may be added four ounces of fresh cow's milk. Repeat this dosage for three evenings, allowing food several hours after giving each dose of medicine. Very weak lambs may be fed more often, and a little stimulant given. Ten days later, give another course of this same treatment.

Prevention of stomach worms is more to be desired than any treatment however successful. It is best accomplished by frequent change of pasture. In case this is impossible, it is a good plan to go out of the sheep business, for stomach worms and profit do not go hand in hand. Fighting this disease is not only an expensive battle, but an uphill task as well.

5. Liver Rot.

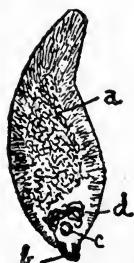
Distomatosis.

This is a disease of deadly importance in low-lying countries but is not common to the sheep raising sections of the west. The sheep is naturally an inhabitant of high altitudes; this factor is in its favor, since to a large extent it keeps it away from noxious parasites to which it is so susceptible.

Feeders who prepare the best mutton for market, and who buy western lambs that have never lost a feed and that have spent their lives at an altitude of from three to ten thousand feet above sea level, will sustain me in making this statement.

Liver rot is due to the *Distoma hepaticum* or *Fasciola hepaticum*; commonly called the liver-fluke.

The life history of the fluke is an interesting one, and may be briefly given as follows: The feces of infected animals contain the embryos which mature in about six weeks under favorable conditions. They then bore their way into the bodies of fresh-water snails, and after passing through certain cycles, emerge as cysts. When these are taken in by sheep in either food or water, they undergo a further development and migrate into the bile duct and on into the liver.



DISTOMA HEPATICUM.

- a. Intestines.
- b. Oral sucker.
- c. Ventral sucker.
- d. Uterus.

(From Kinsley's
"Pathology.")

Just how long a period is spent in the liver is as yet undetermined; nor does the sheep owner care. What he wants to know is how to keep the flukes out of his animals entirely.

Treatment is hopeless. Prevention is the only rational course to pursue. Do not attempt to graze sheep in infected lands. Disinfecting water troughs, if those are used, is a good precautionary measure.

6. Tapeworms.

Moniezia [*Taenia*] *expansa* is the largest of all tapeworms. It is the cause of the so-called "tapeworm plague" in lambs. This is a very rapid growing cestode, accounts being on record of a month old lamb containing a thirty-six foot tapeworm in its intestinal tract.

Moniezia [*Taenia*] *alba* is a rather short, transparent tapeworm.

Several other varieties of tapeworms are sometimes found in sheep, but as they are never discovered until after slaughter, little attention need be given them from a practical standpoint.

Symptoms: The symptoms of tapeworm infestation are a gradual anemia and lack of thrift on good range. Many cases do not show any symptoms whatever.

Treatment: This, as with the foregoing, is largely a matter of prevention. If the ailment can be diagnosed from previous histories of infection in the same band, the following should be given: Starve the lamb all day, allowing suf-

ficient water. At night, given a teaspoonful turpentine in several ounces raw linseed oil; oleo-resin of male fern may be substituted for the turpentine.

7. *Esophagostoma Columbianum*.

This minute parasite is the cause of the common "nodular disease" so often seen in packing houses, where large numbers of sheep are slaughtered. The nodules vary in size; the older and larger ones being calcareous, while the smaller ones contain the parasite embedded in a mucopurulent matter.

The symptoms are so obscure that the presence of the parasite is not discovered until after slaughter.

Treatment is hopeless. Prevention is the procedure for which to strive, and this is not thoroughly understood. The high dry ranges of the extreme West seem infested, and each year more western lambs are affected.

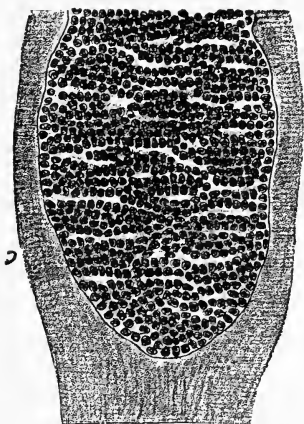
8. *Sarcosporidiosis*.

Sarcocystis tenella; *Miescher's tubules*.

A class of minute parasites infecting the muscular tissues of animals, also known as "Miescher's tubules." It is becoming a very common parasite.

Animals grazed in swampy pastures or near a pond seem to be more commonly affected. Later

investigations seem to show that other animals may be the distributing agent, the sheep being the definitive host.



SACS OF MIESCHER FROM
MUSCLES.

(After Ziegler.)

No ante-mortem symptoms are recognized, and no treatment nor means of prevention is at present known. Removal to a high, dry range, and watering from running streams might prevent the parasite from gaining a hold in the band.

While the meat of a carcass of mutton affected with this parasite is edible, the numerous hemorrhagic spots render it rather unsalable. The diaphragm, peritoneum and other abdominal muscles are the parts commonly affected.

9. Rare Parasites.

Several other rare parasites infest the digestive tract and circulatory systems of sheep, but they are interesting merely from a scientific point of view, and have no practical significance, to the practitioner.



Original water color from collection in
Smithsonian Institution by Walpole

A. HOEN & CO. BALTIMORE.

DEATH CAMAS (*Zygadenus venenosus*)

SECTION XXIII.

POISONS.

Closely approaching in extent the losses among sheep due to parasites are the losses from poisoning. The poisons destructive to sheep naturally fall into three classes, as follows:

- A. Mineral Poisons.
- B. Vegetable Poisons.
- C. Animal Poisons.

On the Western ranges whole bands of sheep, numbering several thousand each, have been wiped out in a week, sometimes even in a single day, from eating poisonous plants or drinking water impregnated with some unsuspected toxic matter.

It is a well known fact that certain localities abundantly supplied with springs are uniformly deadly to sheep. Sometimes only one certain pasture or part of a gulch is affected in this way.

In the mountain ranges a great variety of ore formations occur, such as lead, zinc, copper, silver and gold, salts of which sheep may ingest with their food or drink. Sometimes the poisoning assumes a chronic form, due to the fumes from smelters being deposited on the grass that is eaten by the animals. The diagnosis in these cases is extremely difficult. In sections of the country poisons, such as strychnin, phosphorus and ar-

senic, are used to eradicate predatory animals or squirrels, and not infrequently are distributed where sheep have access to them or are washed to such locations by surface drainage.

In treating cases of poisoning, one should remember the three cardinal principles of toxicology which consist in administering:

First: Chemical antidotes; substances that change the composition of the poison into something inert.

Second: Mechanical antidotes; substances that surround the poison and protect the absorbing tissues.

Third: Physiological antidotes; substances that antagonize the action of the poison by neutralizing its effects on the animal.

Keeping these facts in mind, one can often use ingenuity in selecting substances with which to treat poisoned animals, where the proper antidote is not to be had, a condition that is often the case since sheep are usually found in the most inaccessible parts of the country.

A. MINERAL POISONS.

1. Acute Lead Poisoning.

Acute lead poisoning is rather rare in sheep, but it sometimes occurs in early spring.

Symptoms: Colic, with bloating; suppression of the urine; slow, wiry pulse, with labored breathing; gradual weakness, followed by convulsions and death within a few hours.

Treatment: Dilute sulphuric acid (a 10 per cent solution of the official dilute acid), commonly called "oil of vitriol," in one dram doses, given in a pint of water, forms insoluble lead sulphate.

Epsom or Glauber's salts in one ounce doses dissolved in a pint of water, or a teaspoonful of sulphur mixed with molasses and smeared on the tongue may be given. A dram of potassium permanganate dissolved in a pint of cold water is always good treatment, and may be administered when the exact cause of the poisoning is not known.

Small doses of morphin, atropin, or glonoin may be given hypodermically, or chloral hydrate may be given per rectum.

Treatment in acute cases of lead poisoning is not very successful, as the animals are usually too badly affected to even drench.

Postmortem appearances: Only slight changes are noticeable; this is especially true of the apoplectic form where the animals are found dying in convulsions.

2. Chronic Lead Poisoning.

This is sometimes seen where lead mines are found, or in the vicinity of smelters where the fumes are blown on the grass.

Symptoms: Gradual emaciation, colic, bluish color around the gums followed by death from general weakness.

One must be guided largely by the history of the case, and this is comparatively easy when one is familiar with the country. Old or working

lead mines or smelters may give one a clue as to the cause of the trouble.

Treatment: One-half dram doses of potassium iodid dissolved in a pint of water will hasten the removal of the poison by transforming the lead into lead iodid. Gum acacia in water or raw eggs help to protect the mucous membranes.

Postmortem appearances: Paleness of the intestinal mucosa; ulcers and lead-gray discolorations throughout the alimentary canal.

In a large band of sheep the only practical procedure is a complete change of food and water.

3. Acute Arsenical Poisoning.

Acute arsenical poisoning is very rare in sheep.

Symptoms: Great salivation, eroded tongue, paralysis, stupor, and death in a few hours.

Treatment: Do not give oil. Hydrated iron or even the common iron sulphate in large doses, one-half ounce to a pint of water, may be given. Raw eggs, lime water, sweetened water, sulphur and potassium sulphate are also used. Treatment of acute arsenical poisoning is seldom successful.

Postmortem appearances: Great redness and swelling of the mucous membranes of the alimentary canal.

4. Chronic Arsenical Poisoning.

Chronic arsenical poisoning is sometimes seen after using dips containing arsenic.

Symptoms: Chronic diarrhea, gradual emaciation, and sometimes a short, hacking cough is present.

Treatment: Change of food and water. Iron sulphate in small doses—twenty grains per day—may be given.

Postmortem appearances: Paleness of membranes with a general hydremia. Sometimes the postmortem findings are very obscure.

5. Phosphorus Poisoning.

This is sometimes seen in sections where this poison is used to kill noxious animals, such as squirrels. It usually occurs in the acute form.

Symptoms: Phosphorus poisoning greatly resembles arsenic poisoning in that there is great salivation, a staggers gait, and death from convulsions.

Treatment: One dram copper sulphate (blue vitriol) dissolved in a pint of water; same dosage of potassium permanganate; one tablespoonful turpentine given in mucilaginous solutions neutralizes the poison, changing it into phosphoric acid. Peroxid of hydrogen, lime water, charcoal, and raw eggs are also very useful.

Postmortem appearances: Very similar to arsenical poisoning. In subacute cases no lesions may be observable.

6. Copper Poisoning.

Symptoms: Colic; diarrhea; weakness; slow, wiry pulse.

Treatment: Iron in large quantities; raw eggs; mucilaginous drenches; milk and sulphur.

Postmortem appearances: Inflammation of the intestinal tract is usually present. In chronic light attacks calcareous deposits occur in the kidneys.

7. Zinc Poisoning.

This usually occurs in the chronic form.

Symptoms: Colic; diarrhea; weakness, and general paralysis.

Treatment: Tannic acid in dram doses; sulphur; raw eggs; sugar in water; gums; potassium permanganate.

Postmortem appearances: Paleness and ulcers of the intestinal tract.

8. Mercurial Poisoning.

This is comparatively rare in sheep, although occasionally a sheep herder grows careless and leaves blue ointment lying around so that a lamb or two becomes poisoned.

Symptoms: Salivation; bloody diarrhea; eczema; paralysis, and death from general weakness.

Treatment: Sulphur; iron sulphate; raw eggs.

Postmortem appearances: Signs of inflammation in the bowels, with the liver enlarged, are two symptoms that may help one to arrive at a definite diagnosis.

9. Alkali Poisons.

This includes ammonia, soda, potassa, and salts of these metals. Potassium nitrate, sodium chlorid and sodium sulphate poisoning, being more common than the others, are discussed under separate heads.

Symptoms: Colicky pains; sloughing of the mucous membranes of the mouth and throat; bloody diarrhea, followed by collapse and death.

Treatment: Large quantities of vinegar; raw eggs; demulcents.

Postmortem appearances: Inflammation of the mouth and throat; edema of the larynx.

10. Carbolic Acid Poisoning.

As this is purely an accidental poison, the history of the case will guide one to a correct diagnosis. The odor of the poison, together with the coagulation of the tissues, are very plain symptoms.

Treatment: Alcohol; Epsom salt; Glauber's salt; raw eggs.

11. Mineral Acid Poisoning.

The treatment consists of soapsuds, lime water, baking soda, and an ounce of spirit of camphor may be given as a stimulant.

12. Saltpeter Poisoning.

Treatment consists in giving emollients, such as raw eggs, or mucilaginous gruels. Stimulants, such as spirit of camphor or aromatic spirits of ammonia or whiskey, are indicated, if available.

13. Common Salt Poisoning.

This occurs where sheep have been deprived of salt for a long time and then given it in too generous quantities.

Symptoms: Chiefly a violent gastro-enteritis, with a watery diarrhea and frequent urination. Death occurs in a few hours.

Treatment: Drench with large quantities of water; raw linseed oil; raw eggs, and give spirit of camphor as a stimulant.

14. Epsom Salt and Glauber's Salt Poisoning.

Symptoms: Intense thirst; weakness; watery diarrhea; death in a day or two.

Treatment: Give large quantities of water; raw linseed oil; raw eggs; spirit of camphor, aromatic spirits of ammonia or whiskey as a stimulant.

15. Sheep-Dip Poisoning.

After dipping, some of the animals may show symptoms of trembling, staggers gait, paralysis and death. This may not only have been caused by swallowing some of the solution, but inhaling it into the lungs. The sheepmen are very philosophical about this, and when one or more die they merely shrug their shoulders and take it as a matter of course.

Very little can be done in the way of treatment, for death ensues soon after the appearance of the first symptoms. Alcohol, whiskey, spirit of camphor, Epsom salt solution all may be given. The poisonous action comes from the cresol content



Original water color by N. Brenizer

WOOLLY OR PURPLE LOCO (*Astragalus mollissimus*)

ANDERSON & CO. BALTIMORE.

"Permission Will C. Barnes' Western Grazing Grounds and Forest Ranges."

of the dip, the action of which is similar to that of carbolic acid.

16. Lime Poisoning.

Cases have been known where a bunch of lambs have been confined to a rather close room and lime sprinkled on them to make them sneeze to get rid of the lung worms or grub in the head. Quite frequently the cure has been more disastrous than the original ailment.

The antidote for lime poisoning is vegetable acids, of which vinegar is a common example.

17. Petroleum Poisoning.

This is so rare that one should merely remember to give large quantities of stimulants. It is not absorbed to any great extent, but acts as a mechanical irritant to the tissues.

18. Rare Mineral Poisonings.

Every now and then some rarely used mineral poison or a combination of such poisonings is the cause of the death of one or more sheep, usually lambs. The best thing one can do in case several are still living when called is to administer demulcents and stimulants.

B. VEGETABLE POISONS.

Every experienced person is familiar with the losses incurred among sheep from eating poisonous plants. Sometimes only a few are poisoned and die, while in other cases whole bands of sev-

eral thousand have been wiped out in from a few hours to a few days.

It is a well known fact that most of the losses occur in the early spring when the sheep are hungry for green stuff, or after shipment when the

animals are so nearly starved they will eat greedily any plant they chance to come upon.

The two most efficient methods of prevention, therefore, are: First, keep off the range before the grass is abundant, and, second, keep the animals supplied with sufficient food.

In the early spring certain poisonous plants, such as death camas, begin to grow before the grass. The green, succulent



A PINE TREE GROWING IN SOLID ROCK—Favorite ranges for sheep are composed of mountainous scenes like this. A sheep will thrive where other animals would starve.

shoots are eagerly nibbled and soon trouble ensues. If the animal's rumen is full, and it eats but a few shoots of this plant, usually no symptoms of poisoning follow. That is due to a lack of absorption or the very slow absorption of such

minute quantities as to cause nothing more than a slight discomfort.

Old stockmen regard plant poisoning as preventable diseases. Their young herders often grow impatient to be off for the range, but the older heads look wise and say nothing, and remain in winter quarters. When first starting out in the spring, the "old man" will ride ahead and carefully peer over the grazing ground on the lookout for "pizen."

As Glover of Colorado has well said, "Throughout the vegetable kingdom, from bacteria to the mighty oak, we find species of plants poisonous under certain conditions, but few of them poisonous under all conditions." This is further illustrated by the following statements:

1. Some plants are poisonous only at certain stages of growth; for example, the lupine is poisonous at the time of going to seed; larkspur loses its toxic properties at flowering time; death camas is very deadly in the early spring, but later dries up.

2. Unusual conditions and ecological factors may affect the quantity of poison in plants. The wilted leaves of the wild cherry or choke cherry are poisonous.

3. Poison is found in different parts of the plant, such as in the roots of wild parsnips, the seeds of lupine, the leaves of the wild or choke cherry, and the entire plant of death camas and aconite.

4. Variations occur owing to season and

the climate. These depend also on cultivation and location.

5. Some animals are more susceptible to poison than others. Three sheep of the same age, size and degree of health may eat a few leaves of death camas. One may become violently sick and die in a couple of hours; the second may show signs of slight discomfort and soon recover, and the third one may exhibit no ill effects whatever.

Loss from plants may be due to two causes:

1. The actual toxic material contained in the plant itself, such as in the death camas, or

2. The mechanical irritation arising from the sharp points or awns of the plant, such as foxtail or bearded barley.

Lambs succumb in either case more quickly than adult sheep, due to the absorbing powers of the abomasum, or fourth stomach, and the greater danger from inflammation of the bowels.

Emergency Treatment.

Every sheep man should be advised to have in his medicine chest one hundred or more powders consisting of ten grains each of potassium permanganate and aluminum sulphate. Several long neck pint bottles should be included, and when any sheep gets poisoned, fill the bottle with water and pour the powder into it. Shake well, and give very slowly. Do not set the animal up on its rump to drench it; to do so is to insure traumatic pneumonia, and death. This dose should be repeated in twenty minutes.

Tannic acid in sixty-grain powders should also be carried along, as this is an antidote for many vegetable poisons.

Laudanum, in teaspoonful doses, may be given to quiet the animal and relieve spasms, but treatment at the best is a poor substitute for prevention.

Such measures as slashing the ears and cutting off the tail to bleed the animal, of course, can do no good and are even harmful. There are times when these procedures are useful, but not often in poisonings. Pouring melted lard and other concoctions into the animals usually does more harm than good. This has a tendency to dilute the poison and render it easier of absorption.

Morphin, glonoin, H-M-C and atropin all may be given hypodermically by the veterinarian.

But in all cases of plant poisoning, remember to have on hand the potassium permanganate and aluminum sulphate, the tannic acid, and opium in some form as a hypnotic. Stimulants are often valuable, but when the victim is so far gone as to be unable to swallow, little hope can be entertained for its recovery.

In all cases of vegetable poisoning, the usual treatment given by sheepmen is to administer a large quantity of stimulant, such as several ounces of alcohol or whiskey. In a short time, the animal becomes sleepy, lies still for several hours or more, apparently dead, and then, if recovery takes place, gets up, shakes itself, and trots off, rather weakly, to be sure, but otherwise as if nothing had happened. In many cases, where the exact cause of

the poisoning is not known, this treatment may be given with as good results as any.

1. Death Camas.

Botanical name—*Zygadenus venenosus*.

Common names—*Wild onion; lobelia; poison camas; and poison sego* to distinguish it from the blue or edible camas.

The leaves are lance-shaped, with a simple stem, and bulb-like root, greatly resembling a tough onion. The flowers are greenish-yellow in color. Its toxic principle is an unknown alkaloid.

It is found in all kinds of locations, such as valleys, mountain sides and timber lands. Its habitat seems to be South Dakota, Montana, Idaho, Washington, and parts of Utah, Oregon, Wyoming and California.

One must see this plant growing in its native haunts to get a vivid mind-picture of it.

This has caused the loss of thousands of sheep. Instances have been known where over two thousand have died in one day from the effects of this poison!

Symptoms: These greatly resemble strychnin-poisoning in general. The animal becomes very restless from the severe pain. Trembling and frothing at the mouth are next seen. Death usually takes place in one to three hours, and from one-half to two-thirds of those exhibiting symptoms die.

Treatment: Give a drench of ten grains each of potassium permanganate and aluminum sul-

phate dissolved in a pint of cold water, or water with the chill taken off it. This dose should be mixed up just before using, as it soon loses its strength.

2. Loco.

Botanical name—*Astragalus mollissimus* [purple loco]; and *Aragallus lamberti* [white loco].

Common names—*Rattle weed*; *loco*.

It may be said that when the loco grows in large patches it resembles a field of alfalfa. It is a stemless herb, with numerous leaves, the whole plant being about a foot high.

Its habitat is in the Rocky Mountain region, extending from Montana south to the Mexican line.

Horses are its commonest victims, but occasionally a bunch of sheep become "locoed" to the profane disgust of the owner.

Symptoms: Are characteristic and are not seen from eating any other weed. The animal steps high and seems to lose control of its legs. It develops an insatiate desire for the weed. Other animals imitate the victim out of curiosity and also become victims of the weed.

Treatment: This is largely preventive. When an animal is seen eating loco with apparent relish, remove it from the band at once. If worth saving it may be given teaspoonful doses of Fowler's solution of arsenic once daily.

Do not turn the animals out on pasture when they are very hungry or in the early spring.

3. Larkspur.

Botanical name—*Delphinium*.

This does not cause so much loss among sheep as among cattle. There are many varieties, all more or less poisonous. The tall larkspur grows to a height of nearly four feet, with very smooth leaves and blue flowers. Purple larkspur grows nearly a foot high, bearing very beautiful purple flowers.

Its habitat is in the western range country, but it is not thickly distributed.

Symptoms: The animal walks with a stiff, trembling gait. Frothing at the mouth is noticed, and the victim makes a start for the nearest watering place, but often dies before reaching it. The fact that many animals have been found dead around a water hole has set up the mistaken cry that the water was poisoned.

Treatment: Largely preventive. When the animal is found poisoned, place its head higher than the body. Carefully give the potassium permanganate and aluminum sulphate drench. One-twentieth of a grain of atropin may be given hypodermically. For lambs, reduce this dosage accordingly.

4. Lupine.

Botanical name—*Lupinus*.

Common names—*Wild pea; wild bean; blue bean*.

There are several dozen varieties of lupine, all are legumes or members of the pea family, the



Original water color by N. Brenizer

A. ROEN & CO BALTIMORE

PURPLE LARKSPUR (*Delphinium bi-color*)

"Permission Will C. Barnes 'Western Grazing Grounds and Forest Ranges' "

group to which the clovers and alfalfa belong. None seem to be poisonous until reaching maturity.

The most common lupines are rather tall, with branching forms. The leaves are green above and silver-grey beneath. The flowers vary from blue to white. Its habitat is pretty well distributed over the United States, but it assumes a more poisonous form out in the western range sections.

Symptoms: The sheep becomes excited; walks in a circle, and butts its head against any intervening obstruction. Paralysis then comes on, and death ends the struggle within a few hours to several days. The general symptoms resemble strychnin poisoning greatly.

Treatment: The potassium permanganate and aluminum sulphate drench may be given. In cases of convulsions, laudanum in teaspoonful doses, or chloral hydrate in two-dram doses, or one-quarter grain morphin hypodermically, may be administered. Acids have been tried also.

This is not a very common ailment among sheep, except in small localities. In Germany it often assumes the gravity of an enzootic under the name of "lupinosis."

5. Aconite.

Botanical name—*Aconitum*.

Common names—*Monkshood*; *wolfbane*.

This plant greatly resembles larkspur in that it has a blue flower, but this is "hood shaped." Much confusion exists between this plant and lark-

spur, and the chances are that owing to its pungent taste aconite does very little actual damage. Several species of aconite occur in the United States, the commonest being the *Aconitum Columbianum*; it grows in very high altitudes, up to ten thousand feet, and occasionally a band of sheep, very hungry for green stuff, may eat enough to cause serious results.

Symptoms: Muscular weakness, with labored breathing, and a very weak, wiry pulse. Bloating, frothing at the mouth, and, as death draws near, the eye is greatly dilated.

Treatment: One dram (sixty grains) tannic acid dissolved in an ounce of glycerin and a pint of water is the chemical antidote; atropin given hypodermically in one-tenth grain dosage is the physiological antidote.

6. Water Hemlock.

Botanical name—*Cicuta occidentalis*.

Common names—*Cowbane*; sometimes called *wild parsnip*, but differing greatly from the real *wild parsnip*.

It grows from three to six feet high. Its stem is hollow, green and smooth. The roots are bunched together, and are spindle-shaped, with cross partitions in them. The real wild parsnip has only one thick, fleshy root, which is an easy way to tell the two apart.

The flowers are a dull greenish-white. The plant grows along banks of rivers and marshes, and is pretty well distributed over the West.

It is one of the most deadly of poisonous plants, the toxic matter being found in the root, stem and leaves.

Symptoms: Great abdominal pain, which grows more intense in a few minutes, is the first symptom noticed. Sweating, frothing at the mouth, convulsions, and within half an hour to several hours death takes place in terrible agony.

Treatment: Relief in the great majority of cases is absolutely hopeless. Raw linseed oil, lard, raw eggs, or any agent to soothe the irritated mucous membranes may be given. The potassium permanganate and aluminum sulphate drench may also be administered. Stimulants, such as spirit of camphor, whiskey, ether, aromatic spirit of ammonia or brandy, are indicated.

7. Choke Cherry.

Botanical name—*Prunus demissa*.

Common name—*Choke cherry; choke berry*.

This is a shrub with glistening green leaves, not ordinarily harmful, except when famished sheep are driven through thickets of it. It is found usually in gulches. The poison contained in the leaves is hydrocyanic or prussic acid.

Symptoms: The first symptom noticed after passing through one of these cherry thickets is extreme giddiness; labored breathing, with spasmodic contractions of the bowels and bladder. Spasms continue until death ends the struggle. The attack is speedily fatal if the animals eat of these leaves when their stomachs are empty.

Treatment: Largely preventive; the wise sheep man does not allow his sheep access to the leaves while they are very hungry.

Throwing cold water on the head, with inhalations of ammonia, and the hypodermic injection of one-tenth or one-twentieth grain of atropin is about all that can be done. Even this must be done immediately, and therefore by the herder, to be of any avail.

8. Laurel.

Botanical name—*Kalmia angustifolia*; *kalmia latifolia*.

Common names—*Laurel*; *sheep laurel*; *lambkill*, and in the southern states, *ivy*.

It is a common plant in the eastern part of our country, growing in the woods with great profusion. It is a shrub with a pink flower. It is eaten only when the animals are famished for food or green forage.

Symptoms: Frothing at the mouth; labored breathing; loss of sight; paralysis; coma and death.

Treatment: The potassium permanganate and aluminum sulphate drench may be given at once, and one-twentieth of a grain of atropin hypodermically. Usually the animal is beyond recall when discovered.

9. Veratrum.

Botanical name—*Veratrum viride* or *speciosum*.

Common name—*Hellebore*, *Indian poke root*.

A stout, coarse plant growing about three feet tall. The leaves are broad, with greenish-white

flowers. It is found in moist land. Very little attention need be paid this plant, as sheep will not touch it; a lamb, though, may nibble at it out of mere curiosity and later regret it.

Symptoms: Frothing at the mouth; diarrhea; labored breathing; bloat; great abdominal pain, and death within a short time.

Treatment: One dram (sixty grains) of tannic acid dissolved in an ounce of glycerin and a pint of cold water may be given to form an insoluble precipitate, or raw linseed oil, lard, or raw eggs to soothe the mucous membrane.

10. Ergot.

Botanical name—Claviceps purpurea.

Common name—Smut.

Ergot is a black parasitic growth found on various grasses, being very prevalent on both wild and tame rye. The dust-like, powdery pod is familiar to all.

Its greatest danger is to pregnant ewes, a very small quantity being capable of producing abortion. Sometimes it causes serious losses to a band of sheep by being thickly distributed through the hay.

Symptoms: The animal exhibits symptoms of painful swallowing, gulping as though it were choked. The pulse is slow, breathing shallow, and in gangrenous cases the ears become swollen and purple. Paralysis comes on gradually, death taking place quietly, as though the animal were tired of life.

Treatment: Immediate change of food. One dram of tannic acid (sixty grains) dissolved in a pint of water, to which is added a teaspoonful sweet spirit of nitre. The latter will neutralize the action of the poison in the blood to some extent, while the tannic acid renders the ergot in the stomach inert. Cutting off the ears or tail is sometimes indicated. Painting the necrosed areas with balsam of Peru will help these to heal, in case of recovery.

11. Deadly Nightshade.

Botanical name—*Solanum nigrum*.

Common name—*Deadly nightshade*.

A smooth, wide-branching weed, growing one or two feet high, with clusters of white flowers. The berries, which ripen along in the late summer, are black, almost round, and very juicy. It is common to all sections of the United States.

Symptoms: Giddiness; dilated pupils; great abdominal pain; convulsions, followed by paralysis and death.

Treatment: As this very rarely causes death in sheep, treatment is a secondary consideration. A teaspoonful of soda dissolved in a pint of water may be given, and stimulants, such as whiskey, sweet spirit of nitre or ether, are indicated.

12. Woody Aster.

Botanical name—*Xylorhiza Parryi* [Gray].

This plant, found in Wyoming, and growing on gumbo-clay soil, has killed many sheep in the

past. It is infected with a fungus, and whether this contains the toxic ingredients or the plant itself is poisonous, has not yet been determined.

It is a medium-sized plant, blossoming about the first of May, and grows less poisonous with age, being entirely inactive when withered.

The poison is very fatal to sheep, from ninety to one hundred per cent of the affected animals dying in spite of all treatment.

Symptoms: From one to several hours after eating the plant, depending on the fullness of the first stomach, the animal begins to grow weak; labored breathing is noticed; then bloating, with frequent urinating. Later, a diarrhea sets in, the eyes become dilated, and the animal dies in from several hours to three or four days.

Treatment: No successful line of treatment has yet been worked out. Stimulants, such as one-half ounce aromatic spirits of ammonia in a cup of warm water; dram doses of oil of peppermint in a half-pint raw linseed oil; dram doses of laudanum in oil, have all been tried with varying success.

The best line of treatment is prevention, and avoiding aster patches when the sheep are hungry, especially in the early spring.

13. Sneezeweed.

Botanical name—*Helenium montanum*.

This belongs to the sunflower family, growing from one to three feet high. It has long, lance-shaped leaves, with bright yellow flowers.

It is a very bitter weed, and sheep will not touch it unless almost starved. Sometimes, however, a young animal will develop a taste for it.

Symptoms: Spasms; rapid pulse; labored breathing, and extreme sensitiveness of the skin. There is sneezing and coughing, and death ends the clinical picture.

Treatment: If observed before convulsions take place, a pint of melted lard may be given. Removal from infected pastures is the only logical procedure. The weed is very abundant on old, worn-out ranges, and is mute testimony to the folly of over-grazing.

14. Rubber Weed.

Botanical name—Hymenoxys floribunda.

Also known as "pingue", the Spanish name of the weed.

This is a small weed, bearing a yellow flower, and is found in the semi-arid ranges of southern Colorado and northern New Mexico. It does not contain any poisonous principle, so far as is known, but causes death by forming a rubber-like obstruction in the intestinal tract.

Symptoms: The animal appears drowsy, and loses its appetite. It lies down and refuses to get up. Death takes place in from one to several hours after the first symptoms are noted.

Treatment: As this is a very obscure disorder, treatment is still in the experimental stage. It has been found through practical experience that a



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Water color by N. Brenizer

LUPINE (*Lupinus*)

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pint of warm brine given every hour will do as much or more good than anything yet tried. This may have a tendency to dissolve the mass.

15. Strychnin.

This is an accidental poisoning, the plant not growing in this country. The trouble usually follows attempts to poison noxious animals, and the sheep may get enough to kill them.

Symptoms: The signs of strychnin poisoning are familiar. First is noticed a restlessness, labored breathing, rapid, wiry pulse, and the animal walks as though it were on stilts. The muscles twitch, the eyes become bloodshot, and there is frothing at the mouth. Convulsions set in and the animal dies with spasmodic twitching of the limbs.

Treatment: One dram (sixty grains) tannic acid dissolved in glycerin and water, an ounce of the former to a pint of the latter, followed by two drams chloral hydrate dissolved in a half-pint of water or given per rectum. Morphin in one-fourth grain doses may be given hypodermically. Raw eggs are excellent, while raw linseed oil or melted lard seems to assist in keeping the poison from being absorbed.

16. Cotton Seed Meal.

Poison by this valuable food is usually seen where there is too heavy feeding of oil cake.

Symptoms: There is a bloody diarrhea and bloody urine; cramps; bloat, and great abdominal pain.

Treatment: Immediate change of food. Lambs may be given an ounce of castor oil and several raw eggs.

17. Tobacco.

Botanical name—Nicotiana.

Sometimes seen after the use of tobacco or nicotine dips.

Symptoms: Great abdominal pain; frothing at the mouth; diarrhea; bloat; convulsions, followed by paralysis, and death within an hour or so after the first symptoms are noticed.

Treatment: One dram (sixty grains) tannic acid dissolved in a pint of water, to which has been added an ounce of glycerin. Black coffee may also be given.

18. Digitalis.

Digitalis poisoning very rarely occurs in sheep, as the digitalis plant, commonly known as fox-glove, is a cultivated drug plant.

The symptoms are variable and one must know the complete history of the case in order to make a definite diagnosis.

No cure or antidote is known, although the tannic acid drench may be given a trial.

19. Turpentine.

In the western range sections sometimes when the sheep are almost famished and food is scarce they will eat enough shoots of young evergreen trees to cause turpentine poisoning.

Symptoms: Acute gastro-enteritis; colic; constipation, the pellets voided being covered with a bloody, slimy mucus. The urine becomes bloody and general weakness follows. The course is a gradual one, sometimes lasting from several days to a couple of weeks.

Treatment: Removal from the offending pasture. Tannic acid in dram doses, together with whole flaxseed jelly to soothe the irritated urinary membranes. Small doses of lead acetate (from five to ten grains) may be given daily.

20. Rape Seed.

This causes inflammation of the bowels, bloody diarrhea, convulsions and death.

The treatment is wholly symptomatic, and when the malady has reached an advanced stage, treatment is hopeless.

21. Croton Oil.

When administered to cure constipation, sometimes an overdose is given. Violent cramps with a watery dysentery follow. Raw eggs, containing teaspoonful doses of laudanum, may be given, but death is the usual sequel.

22. Hemlock.

Botanical name—Conium maculatum.

Poisoning by this is very rare; the acrid taste of the hemlock keeps the sheep from eating it, even though they be almost starved. The usual victims are lambs and the end is death.

Symptoms: Are convulsions, followed by complete paralysis.

Treatment: While almost always fatal, one may administer one dram tannic acid dissolved in an ounce of glycerin and a pint of water. Spirit of camphor in tablespoonful doses can be given as a stimulant.

23. Flax.

Botanical name—*Linum usitatissimum*.

In sections where flax is extensively raised occasional cases of poisoning among sheep have been known.

Symptoms: Colic; diarrhea; convulsions and death.

Treatment: Give the tannic acid drench.

24. Horse Radish.

Botanical name—*Cochlearia armoracia*.

Sometimes in the early spring, sheep eat too much of this common garden plant, and a violent colic and diarrhea takes place.

The treatment consists in giving one dram of tannic acid dissolved in a pint of water. Several raw eggs beaten up can be next given to soothe the irritated mucous membranes.

If the horse radish is old and strong the animal will not need to be blanketed to keep it warm, and if it should die the flesh will not need seasoning.

25. Toadstools.

These are never eaten by sheep, but if a lamb nibbles at one, the symptoms following are almost

maniacal in form. Not much can be done, but a teaspoonful tannic acid dissolved in a cup of water may be given with advantage in some cases.

26. Potato Tops.

The symptoms greatly resemble foot-and-mouth disease, and the tannic acid drench should be tried.

27. Poison Oak.

Botanical name—*Rhus diversiloba*.

Common names—*Poison ivy; poison sumac*.

There are a number of varieties in this group, and poisoning rarely occurs in sheep from any of them. In case it does, drenches of raw linseed oil in pint doses seem to do more good than anything else yet tried. The course of the ailment is a lingering one, sometimes lasting over a week.

28. Kafir Corn and Sorghums.

Losses sometimes occur in sheep in the autumn from turning in fields from which kafir corn or sorghum have been harvested. The young stubble contains hydrocyanic (prussic) acid, or substances that may be changed into this acid when ingested by herbivora. It is very deadly to cattle and sheep. Hogs seem to be immune.

The only beneficial treatment known is to give a drench of the potassium permanganate and aluminum sulphate, twenty-grain doses of each, dissolved in a pint of water. However, as death often occurs within a very few minutes after the first symptoms of poisoning are shown, treat-

ment is frequently impossible. As kafir and sorghum stubble is not uniformly poisonous it may be worth while to "try" it with only a few sheep otherwise it is unsafe to turn a band onto such forage. The danger is greater in dry seasons than in normal seasons.

29. Bearded Grasses.

A number of grasses such as foxtail, bearded barley or wheat, cheat, needle-grass and sand-burrs all cause trouble to sheep by mechanical irritation. A violent gastro-enteritis is often induced by eating them. Sometimes a bunch of the spikes or awns lodge in the mouth under the tongue and the animal starves to death from inability to eat.

When once affected, absolutely no treatment is known that is successful if the irritation occurs in the stomach or bowels. A careful post-mortem examination will reveal the cause, and an extensive repetition of the trouble can be avoided by changing pastures.

30. Ensilage.

Cases have been known where a large number of sheep have been killed by feeding on mouldy silage, or silage that apparently was in good condition, but contained the fungus, "Penicillium."

The symptoms are the same as from mouldy feed of any kind: A violent colic, constipation, followed by fetid diarrhea, convulsions and death.

Treatment is very unsuccessful, since, when the animals begin to exhibit typical symptoms, fatal

quantities of the toxic principles have already been absorbed.

Large doses of potassium permanganate, one dram or sixty grains dissolved in a pint of water, may be given. The triple sulphocarbolates, in sixty grain doses, combined with a dram of tincture of ginger and an equal quantity of dioscorea may also be tried.

If only camp remedies are at hand, give a teaspoonful of powdered ginger, and one-fourth teaspoonful each of salt and pepper dissolved in a pint of lukewarm water. Teaspoonful doses of turpentine in raw linseed oil may be tried, but in cases where there is great inflammation of the mucous membranes of the stomachs and bowels, this seems to make matters worse. Raw eggs are always valuable in soothing this irritation.

31. Porcupine Grass.

Botanical name—*Stipa*.

While over a hundred varieties of this grass are known to botanists, only one, "Sleepy Porcupine Grass," is known to be poisonous to sheep.

This is commonly a native of the Southwest, abounding especially in southern Colorado, western Texas, lower California, Arizona, and New Mexico. It grows at an elevation of from 5,000 to 9,000 feet; is a very hardy plant, about three to five feet tall, with peculiar long, flat leaf-blades, hence the name "porcupine grass." The stalks and leaves are bright green, and the seeds very coarse.

Only when the animals are very hungry or the feed extremely scarce will sheep eat it.

The symptoms of poisoning are insidious, but not particularly fatal. The animal becomes droopy and appears sleepy. Finally, it lies down, and to the inexperienced, the band is minus another sheep. However, in a little while, depending on the amount eaten, the victim awakes and trots off as though nothing had happened.

32. Uncommon Plant Poisonings.

Occasionally a plant will cause trouble in some locality that is not known generally. Also, one comes into contact with poison cases that have occurred in almost unheard of manners. Even in the west, on one forest range, a peculiar grass, such as "bear grass," may be found on one side of the mountains, causing much trouble; while on the other side it is unheard of. Many local poisons have not been touched upon for the reason that space forbids.

It requires often the utmost skill to unravel cases that at first defy diagnosis. Eliminating spoiled food, acute infectious diseases, parasites, nearly all range enzootics can be traced to some poison ingested in the food or water.

In every case where the diagnosis is shrouded in mystery, the sheep should be moved to other quarters and given different food and water. These two precautions will often work wonders. An investigation can then be made.

In some parts of the northwest, two plants



Original water color from collection in
Smithsonian Institution by Walpole

A. HOEN & CO. BALTIMORE

ACONITE (*Aconitum Columbianum*)
MONK'S HOOD

"Permission Will C. Barnes 'Western Grazing Grounds and Forest Ranges' "

found among the foothills of the summer ranges have been condemned by sheep men as poisonous. These are the scutellaria or skullcap, and a form of wild pea, with small white flowers. Poisoning from these usually occurs in the early spring, and perhaps they are only harmful when ingested in large quantities by a hungry animal.

In the eastern part of the United States, poke-root, corn cockle, horse nettle, jimson weed, horse chestnut and the castor bean have all caused occasional deaths among sheep. It is not common, however, and the animal is dead before discovered, as a rule. The treatment for these cases, if they are discovered in time, consists of large doses of tannic acid dissolved in water.

In the central states, especially in the river valleys, wild or blue pea has caused some fatalities. It may be said, with safety, that almost every vicinity, even neighborhood, where sheep are kept, has its peculiar poisonous plants.

In all cases, however, the treatment is nearly the same. Large doses of some form of alcohol, tannic acid, or potassium permanganate may be given.

C. ANIMAL POISONS.

Sheep are practically immune to this class of poison, as under this head are found snake bites, insect stings, caterpillars and grubs taken in the food, and cantharides or Spanish fly.

As the sheep is such a dainty eater it is not troubled by ingesting animal poisons, and the others have no deleterious effect on the sheep.

SECTION XXIV.

PREDATORY ANIMALS.

While all live stock suffer from the depredations of predatory animals, the sheep man is a heavier loser than the owner of other domesticated animals. In the eastern states the mongrel dog has nearly ruined the industry; in the western states, where sheep are raised by the million,



COYOTE KILLERS—The Russian wolf hound is a favorite with coyote hunters.

a varied assortment of animal pests annoy the stockmen.

Notwithstanding the bounties given by both the state and live stock associations, it is not an exaggeration to say that over five million dollars'

worth of sheep are destroyed annually by predatory animals, in the west alone. Some years ago, when California offered a bounty of five dollars per coyote, over 70,000 were killed in one year, and to keep from being bankrupted, the state repealed the law. Last year, in less than nine months, nearly 15,000 coyotes were killed in Idaho and presented for bounty and the appropriation exhausted. Because these campaigns against predatory animals have been only sporadic they have allowed them to increase enormously during the past few years and become a serious menace to the live stock industry. If every state would offer a uniform bounty for the next ten years, these marauders would soon become practically exterminated.

The chief predatory animals are the coyote, lynx, wild cat, cougar and wolf. The bear is classed as a sheep killer but is grouped in bad company, and prairie dogs are a nuisance in destroying the grass on the range where they abound. The coyote does as much damage as all the others combined, the wolf does not care much for mutton but is especially annoying to cattlemen. It is a common estimate in the west that a coyote destroys \$100 worth of property a year, and a wolf \$1,000. The mountain lion or cougar is the particular enemy of deer, one cougar killing, on the average, fifty of these beautiful, timid animals a year. Only one bear, perhaps, out of a hundred turns "meat eater" and harms the stockman.

1. The Coyote.

“Th’ durndest, sneakin’est reptile thet lives” is the unanimous verdict of all western stockmen. This animal is a member of the dog family,



COYOTE.

and has all the cunning attributes claimed for him by disgusted “buckaroos” who have exhausted their patience in trying to shoot, trap or poison him.

While civilization drives the rest of wild animal life still farther back into the mountains, the

coyote seems to appreciate the coming of the emigrant. With the greatest of enjoyment he lives off of fat lamb or veal, and no cleric relishes chicken any better than he. In the most unlooked for places, sometimes not forty rods from the barn, the coyote rears a husky family of five to ten young, and manages to support them in



THE OLD WOLF SHOT AND HELPLESS.

comfort and affluence despite the high cost of living, which because of him is made even higher for all meat consumers.

In the spring the coyote welcomes lambing time, and when the band of sheep are driven to the summer range he accompanies the outfit. Many a lamb in straying too far from its mother provides a juicy dinner for the unseen but ever-present coyote. In the fall, he returns, invig-

orated after a summer vacation in the mountains, and dines with regularity on turkey, duck or chicken. Too cunning to be trapped; too wily to be shot, the best way to get rid of him is to run the brute down with hounds.



WOLF PUPS IN FRONT OF DEN.

In the past few years, in the northwest, coyotes have been spreading rabies to an alarming extent. Due to this, the Federal government is just starting an all-western campaign against this animal, the worst enemy of the stockman in general, and the sheep raiser in particular.

2. Wild Cat and Lynx.

A "bobcat" getting among a band of sheep seems to kill for the sole pleasure of killing. A hundred or more sheep will be found dead, untouched, save for the gash in the throat.

They are very cowardly and shy, and for this reason do not perform a great deal of damage.



WILD CAT.

Still, one bobcat with a taste for blood will make life a tragedy for any sheepman until it is destroyed. Bobcats are rather easily treed with good dogs; then they may be knocked in the head amid great rejoicing.

In 1915 Idaho and Wyoming paid a bounty on over fifteen hundred wild cats and lynx.



LYNX CAT CAUGHT IN TRAP—Sopris National Forest, Colorado.

3. Wolf and Cougar.

Fortunately for sheepmen these two animals do not seem to relish mutton as much as they do deer, cattle and horses.

The wolf is especially dangerous to the cattleman, and often kills for mere pastime. It is very difficult to destroy, being almost as cunning as the coyote. They breed rapidly, and some sections of the west are so infested with them it is almost impossible to raise horses or cattle.

The cougar or mountain lion is a great coward, and shuns civilization. It does great damage to deer, and occasionally one develops a taste for

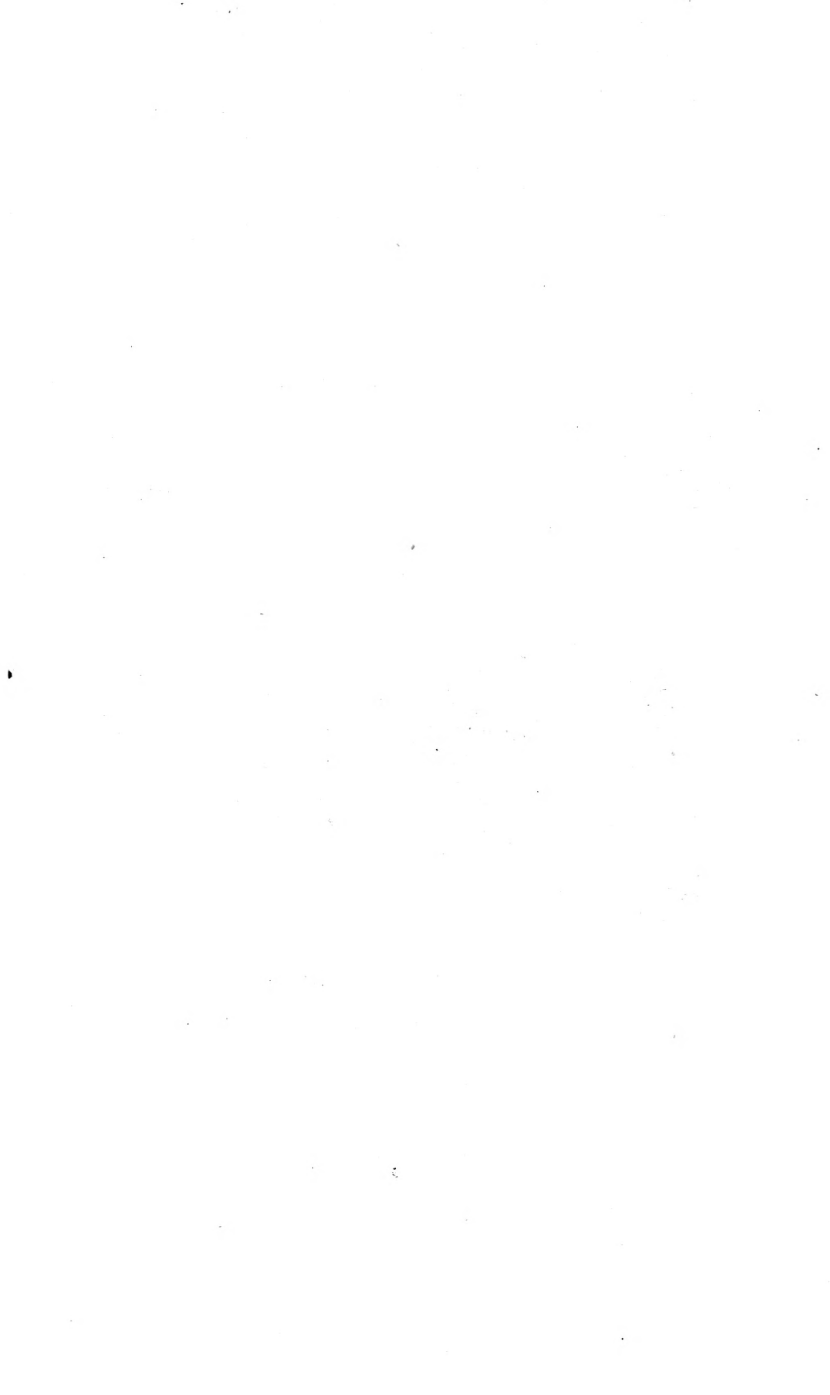


A HOEN & CO

Original water color from
collection in Smithsonian
Institution by Walpole

WATER HEMLOCK (*Cicuta Vagans*)

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young lamb. They usually stay close to some body of water where the deer come to drink, and kill one or two a week.

The best way to hunt cougar is with good hounds, for when treed they make little effort to get away, resembling a cat in this respect. They are very powerful; one who has looked into the sneering face of a cougar treed by several dogs will never forget the sight.

About one hundred wolves were killed in Idaho and Wyoming, and possibly a dozen cougars in 1915.

4. Bear.



A SHEEP-KILLING BEAR.

This harmless animal is the victim of a bad name, due to an occasional bear turning "meat eater" and destroying stock with frightful rapid-

ity. The average bear, however, attends strictly to his own business, and keeps away from the white man as though the latter were a bill collector.

Bears are often mischievous, and sometimes a shepherd will return to his camp to find his light house-keeping outfit slightly mussed up and worse from wear after the visit of a prowling bear. The bacon and sugar will be among the things missing, and much profanity will be indulged in by the outraged herders.

Bears are not predatory animals and should not be classed as such.

5. **Prairie Dog.**

This pest merely destroys the range. It has been estimated thirty-two of these busy little animals will eat as much grass as one sheep and as a single village contains thousands of these rodents, it can readily be seen how destructive they really are.

They are combatted with poisoned grain, and in the early spring, when the grass is scarce, this method kills them by the thousand.

SECTION XXV.

QUARANTINE AND TRANSPORTATION REGULATIONS.

There was a time not many years ago when all government and state regulations regarding live stock inspection was looked upon as "fool red tape." In "them good old days" an unscrupulous and bull-headed man could drive a band of scabby sheep wherever he desired so long as he kept out of reach of the bullets from angry cattle-men or sheep men. State lines, forest preserves, scab eradication, quarantines and supervision of live stock were Greek to him. "They ain't no sech thing as germs," he would laugh and drive on.

But a new era approached. Successful stockmen began to see what a quarantine would do in the control of contagious diseases, such as scab. The benefits accruing from laws designed to curb the migrations of lawless, careless men who cared little how much infection they scattered, were self-evident. This sentiment grew in favor, until the western sheep raising states have the most stringent regulations in the country. These laws have been enacted by the sheepmen themselves and are models of clear, common-sense rules, designed to be of the greatest benefit to the greatest number.

It is true there has been friction. Sometimes an officious, undiplomatic "two-bit" government inspector was sent out from the extreme eastern part of our country. Not being familiar with the rough and ready methods of the west he became about as popular as smallpox. In other cases, ignorant and dishonest state officials, appointed through political trickery and not because of merit, made enemies among the better class of sheep men. Oftentimes sheep raisers without any regard or reason for sensible laws caused trouble. These three factors have caused more or less turmoil, but it is fast dying down.

To keep sheep free from scab or other contagious diseases has proven to be the greatest boon to the industry. To be able to call in expert assistance to diagnose some mysterious malady or enzootic at the beginning of the trouble has been of inestimable benefit. To enforce these laws designed for the good of the greatest number has been the duty of the government and state.

Within the boundaries of its own borders, the laws of a state are supreme. When movements of live stock occur between the states, constituting "interstate commerce," the Federal government is the master. Therefore, by government regulations, a state that will not conform to reasonable rules cannot ship out of the state into another, and is, therefore, by indirection compelled to comply with Federal regulations, even in matters that are essentially intrastate.

Ten years ago over twelve million sheep were dipped under the government supervision per

year, while unnumbered thousands were dipped by state officials. The results of this campaign have been so good that but little scab now remains in this country.

1. Federal Regulations.

The Acts of February 2, 1903, and March 3, 1905, regulating the movement of sheep from one state to another, are largely responsible for eradicating the scab from our country.

To illustrate the stringency of these regulations the text in full is herewith given:

REGULATION 4. TO PREVENT THE SPREAD OF SCABIES IN SHEEP.

(Acts of Feb. 2, 1903, and Mar. 3, 1905.)

MOVEMENT OF SHEEP AFFECTED WITH SCABIES.

SECTION 1. *Paragraph 1.*—No sheep which are diseased with scabies shall be shipped, trailed, or otherwise removed, or allowed to drift, from one State or the District of Columbia into another State or the District of Columbia, except as hereinafter provided, and no sheep shall be shipped, trailed, or otherwise removed, or allowed to drift, from a State or a portion thereof quarantined for the disease of scabies in sheep into another State or the District of Columbia except as hereinafter provided.

Paragraph 2.—No sheep shall be trailed or driven or hauled in private conveyances from the quarantined area in any State to any point in the same State not included in the quarantined area and subsequently delivered to a transportation company for shipment to any other State or the District of Columbia until the sheep shall have been inspected by an inspector of the Bureau of Animal Industry and found to be free from disease and from exposure thereto, and are accompanied by a certificate from the said inspector.

Paragraph 3.—All of the sheep in a certain flock or shipment in which the disease is present shall be classed as diseased sheep, and none of them shall be removed or offered for interstate shipment until dipped as hereinafter provided. The practice of "picking" a flock—that is, removing any sheep which are visibly diseased and then offering any portion of the remaining sheep for either inspection or interstate shipment, or both—is directly and positively prohibited.

SHEEP EXPOSED IN TRANSIT.

SECTION 2. Healthy sheep in an area not quarantined for the disease of scabies in sheep which have not been exposed to the disease by coming in contact with diseased sheep or infectious premises may be shipped or trailed interstate without restriction by the regulations of the Secretary of Agriculture to prevent the spread of scabies in sheep; but if said sheep be unloaded en route or at destination and are placed in infectious premises they shall thereafter be treated as exposed sheep and shall not be forwarded to destination for purposes other than immediate slaughter until they shall have been dipped, under the supervision of an inspector of the Bureau of Animal Industry.

MOVEMENT OF SHEEP FOR IMMEDIATE SLAUGHTER AND FOR STOCKING AND FEEDING.

SECTION 3. *Paragraph 1.*—Sheep that are diseased with scabies and that have been dipped once in a permitted dip under the supervision of an inspector of the Bureau of Animal Industry within 10 days of date of shipment may be shipped interstate for immediate slaughter to a recognized slaughtering center, and when so shipped the said sheep shall not be diverted en route and shall be slaughtered within two weeks after arrival at destination. If diseased sheep are to be shipped interstate for stocking or feeding purposes they shall be dipped twice as above indicated, 10 days apart, and shall be submitted to inspection before shipment.

Paragraph 2.—Sheep that are not diseased with scabies but which have been exposed to the contagion of the disease may be moved interstate for feeding or stocking purposes after one dipping, or they may be shipped interstate by rail or boat to a recognized slaughtering center for immediate slaughter without dipping.

TRANSPORTATION REQUIREMENTS FOR DISEASED AND EXPOSED SHEEP.

SECTION 4. When diseased sheep have been dipped once and are shipped interstate for slaughter in accordance with section 3, paragraph 1, or when exposed sheep are shipped interstate without dipping for immediate slaughter in accordance with section 3, paragraph 2, the transportation company shall affix to both sides of each car or boat a durable placard not less than 5½ by 8 inches in size, on which shall be printed with permanent black ink in bold-face letters not less than 1½ inches in height the words "DIPPED SCABBY SHEEP" or "EXPOSED SHEEP FOR SLAUGHTER," as the case may be. These placards shall also show the name of the place from which the shipment was made, the date of the shipment (which must correspond with the date of the waybills and other papers), the name of the transportation company, and the name of the place of destination. Each of the waybills, conductors' manifests, memoranda, and bills of lading pertain-

ing to such shipments by cars or boats shall have the words "DIPPED SCABBY SHEEP" or "EXPOSED SHEEP FOR SLAUGHTER," as the case may be, written or stamped upon its face. Whenever such shipments are transferred to another transportation company or into other cars or boats, or are rebilled or reconsigned to a point other than the original destination the cars or boats into which said sheep are transferred and the new waybills, conductors' manifests, memoranda, and bills of lading covering such shipments by cars or boats shall be marked as herein specified for cars or boats first carrying said sheep and for the billing, etc., covering the same. If for any reason the placards required by this regulation are removed from the car or boat or are destroyed or rendered illegible, they shall be immediately replaced by the transportation company or its agents, the intention being that legible placards shall be maintained on the cars or boats from the time of shipment until they arrive at destination, and the disposition of the cars or boats is indicated by an inspector of the Bureau of Animal Industry.

PERMITTED DIPS.

SECTION 5. *Paragraph 1.*—The dip at present permitted by the department for the treatment under official supervision of sheep affected with or exposed to scabies is the lime-sulphur dip made in the proportion of 8 pounds of unslaked lime (or 11 pounds of commercial hydrated lime—not air-slaked lime) and 24 pounds of flowers of sulphur to 100 gallons of water. The dipping bath should be used at a temperature of 100° to 105° F., and must at all times be maintained at a strength of not less than 1½ per cent of "sulphid sulphur," as indicated by the Bureau of Animal Industry field test for lime-sulphur baths.

Paragraph 2.—A proprietary brand of lime-sulphur solution may be used in official dipping only after specific permission therefor has been issued by the Bureau of Animal Industry. No dip other than the lime-sulphur dip will hereafter be given department permission for use in the official dipping of sheep for scabies unless it has been shown to the satisfaction of the Bureau of Animal Industry (1) that the strength of the bath prepared therefrom may be satisfactorily determined in the field by a practical portable testing outfit; (2) that, under actual field conditions, the dipping of sheep in a bath of definite strength will effectually eradicate scabies infection without injury to the animals dipped.

LOSSES FROM DIPPING.

SECTION 6. The dipping shall be done carefully and the sheep handled as humanely as possible. The department disclaims responsibility for any loss or damage resulting from dipping, and those who wish to avoid any risks that may be incident to dipping at the stockyards, as well as to avoid liability to prosecution, should see that their sheep are free from disease before shipping them to market.

SHEEP DISEASED OR EXPOSED IN TRANSIT.

SECTION 7. Sheep shipped interstate under a certificate from an inspector of the Bureau of Animal Industry are not guaranteed uninterrupted transit, for in the event of the discovery of scabies or of exposure thereto en route the sheep shall thereafter be handled as diseased or exposed sheep, as hereinbefore provided, and the cars or other vehicles and the chutes, alleys, and pens which have been occupied by them shall be cleaned and disinfected, as hereinafter provided in section 9 of this regulation.

SHIPMENTS FROM PUBLIC STOCKYARDS.

SECTION 8. *Paragraph 1.*—Public stockyards shall be considered infectious and the sheep yarded therein as having been exposed to the disease, and no sheep shall be shipped interstate therefrom, except for immediate slaughter, without dipping. Where, however, a part of all of the stockyards is reserved and set apart for the reception of uninfected shipments of sheep and is kept free of disease, sheep may be shipped interstate from the uninfected yards or portions thereof without dipping.

Paragraph 2.—If diseased sheep are introduced into the uninfected yards or portions thereof, they shall be immediately removed therefrom and the chutes, alleys, and pens occupied by the said sheep shall be thoroughly cleaned and disinfected. No sheep shall be shipped interstate from any stockyards where an inspector of the Bureau of Animal Industry is stationed without a certificate of inspection or of dipping issued by the said inspector.

DISINFECTION OF CARS, PREMISES, ETC.

SECTION 9. Cars and other vehicles, yards, pens, sheds, chutes, etc., that have contained diseased sheep shall be cleaned and disinfected in the following manner: Remove all litter and manure and then saturate the interior surfaces of the cars and woodwork, flooring, and ground of the chutes, alleys, and pens with a solution made with 6 ounces of 95 per cent pure carbolic acid to each gallon of water, or a solution containing 4 ounces of cresol compound U. S. P. to each gallon of water. When either disinfectant is used sufficient lime (not to exceed $1\frac{1}{2}$ pounds per gallon) should be added to show where it has been applied. Cars and premises are not required to be cleaned and disinfected on account of their having contained "dipped scabby sheep" that have been dipped within 10 days or sheep that have been exposed to scabies.

AMENDMENT 6 TO B. A. I. ORDER 210.

Effective on and after February 1, 1916.

UNITED STATES DEPARTMENT OF AGRICULTURE,

OFFICE OF THE SECRETARY.

Under authority conferred upon the Secretary of Agriculture by the provisions of the acts of Congress approved May

29, 1884 (23 Stat., 31), February 2, 1903 (32 Stat., 791), and March 3, 1905 (33 Stat., 1264), as amended by the act approved March 4, 1913 (37 Stat., 828, 831), it is ordered that regulation 1, section 4; regulation 2, sections 4 and 8; regulation 3, section 12; regulation 4, section 9; regulation 5, sections 2 and 3; and regulation 7, section 2, of B. A. I. Order 210, "Regulations Governing the Interstate Movement of Live Stock," dated May 20, 1914, and effective July 1, 1914, as amended, be, and the same are hereby, further amended so as to permit the use of "saponified cresol solution" as a substitute for compound solution of cresol U. S. P. in the disinfection of cars, boats, other vehicles, and premises that have contained live stock affected with a contagious or communicable disease, for the disinfection of swine to prevent the spread of hog cholera and swine plague, and for preparing a dressing for sheep to prevent the spread of lip-and-leg ulceration (necrobacillosis); provided, however, that such saponified cresol solution shall conform to the following requirement:

1. The formula of the product shall employ not less than 28 per cent by weight of linseed oil. Either caustic potash, caustic soda, or a mixture of caustic potash and caustic soda may be used to saponify the linseed oil. The cresol used must be at least 95 per cent pure, and enough of this commercial grade of cresol (cresylic acid) must be employed in compounding the disinfectant to bring the actual amount of cresol in the finished product up to 50 per cent.

2. The product shall remain a homogeneous liquid when cooled to 32° F. It shall contain substantially no unsaponified linseed oil or excess alkali. It shall be readily soluble in cold distilled water; the solution shall be practically clear and shall contain no globules of undissolved oil or cresylic acid.

3. Manufacturers wishing to offer saponified cresol solution as indicated above for use in official disinfection must first submit a sample of at least 8 ounces for examination, together with a statement of the formula employed and a guaranty that the product will be maintained of a quality uniform with the sample submitted.

4. To prevent confusion, each product must bear a distinctive trade name or brand, together with the name of the manufacturer or distributor.¹ There shall be no mention of the United States Department of Agriculture or the Bureau of Animal Industry on the labels, containers, or printed matter accompanying products permitted to be used in offi-

¹A "Rule to prevent the spread of scabies in sheep" is in effect through the entire year. This rule prescribes the quarantined area in the respective States and should be considered in connection with these regulations. Copies of the rule may be obtained from the Chief of the Bureau of Animal Industry, Washington, D. C.

cial disinfection. The permitted saponified cresol solution shall be used at a dilution of at least 4 ounces of the solution to 1 gallon of water.

It is further ordered that the regulations hereinbefore specified be, and the same are, modified and amended to permit the use of substances for disinfecting infectious cars, boats, other vehicles, and premises, as follows:

Compound solution of cresol U. S. P., or a specifically permitted brand of "saponified cresol solution," at a dilution of at least 4 fluid ounces to 1 gallon of water, or liquefied phenol U. S. P. (liquefied carbolic acid) at a dilution of at least 6 fluid ounces to 1 gallon of water, without the addition of lime to show where the solution has been applied. Chlorid of lime U. S. P. (strength, 30 per cent available chlorin). This chlorid of lime solution to be used at a dilution of 1 pound of chlorid of lime to 3 gallons of water.

Amendment 5 to B. A. I. Order 210, dated September 17, 1915, shall cease to be effective February 1, 1916, on and after which date this amendment, which for the purpose of identification is designated as Amendment 6 to B. A. I. Order 210, shall be effective.

Done at Washington this 20th day of January, 1916.

Witness my hand and the seal of the Department of Agriculture.

D. F. HOUSTON, *Secretary of Agriculture.*

SECTION 5. *Paragraph 1.*—The dips at present permitted by the department for the treatment, under official supervision, of sheep affected with or exposed to scabies are as follows:

Lime-sulphur dip made in the proportion of 8 pounds of unslaked lime (or 11 pounds of commercial hydrated lime—not air-slaked lime) and 24 pounds of flowers of sulphur or sulphur flour to 100 gallons of water.

Nicotin dip containing not less than five one-hundredths of 1 per cent of nicotin, provided there is added thereto to prevent reinfection 2 per cent of flowers of sulphur or sulphur flour.

The dipping bath should be used at a temperature of 100° to 105° F., and must at all times be maintained at a strength of not less than 1½ per cent of "sulphid sulphur" in the case of the lime-sulphur dip, and not less than five one-hundredths of 1 per cent of nicotin in the case of the nicotin dip as indicated by the field tests for such baths approved by the Bureau of Animal Industry.

This amendment, which for the purpose of identification is designated as Amendment 4 to B. A. I. Order 210, shall be effective on and after March 1, 1915.

Done at Washington this 20th day of February, 1915.

Witness my hand and the seal of the Department of Agriculture.

D. F. HOUSTON, *Secretary of Agriculture.*

2. State Regulations.

State laws in regard to sheep are continually changing due to unforeseen contingencies. The most attention has been given state inspection in the Rocky Mountain region, which is the home of perhaps one-half the sheep in this country.

In brief, the laws of the several states may be summarized as follows:

1. Those states at present having no laws regarding the admission of sheep into their boundaries from other states are: Arkansas, Connecticut, Delaware, Georgia, Illinois, Kansas, Maine, Maryland, Massachusetts, Michigan, Missouri, New Hampshire, New Jersey, Ohio, Oklahoma, Pennsylvania, Rhode Island, Vermont and Virginia.

2. Those states requiring a "health certificate," at present, are: Alabama, Iowa, Kentucky, Louisiana, Minnesota, Mississippi, Nebraska, North Carolina, North Dakota, South Carolina, South Dakota, Tennessee, Texas, Washington and West Virginia.

3. Those requiring compliance to Federal regulations, at present, are: Arizona, California, Colorado and Florida.

4. States accepting only their own officials' inspection and dipping the sheep before entering their boundaries if from a state under Federal quarantine, at present, are: Idaho, Montana, Nevada, New Mexico, Oregon, Utah and Wyoming.

Space forbids giving the state laws at length; and, furthermore, they are of interest to only a limited number.

LIST OF PUBLICATIONS CONSULTED.

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Friedberger and Frohner's Pathology.
Moore's Pathology.
Kinsley's Pathology.
Sisson's Anatomy.
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William's Obstetrics.
Quitman's Materia Medica.
Craig's Sheep Farming.
Wing's Sheep Farming in America.
Kleinheinz's Sheep Management.
Stewart's Shepherds' Manual.
Barnes' Western Grazing Grounds.

BULLETINS.

No. 20, Div. of Botany, U. S. Dept. Agr.
No. 20, Div. Bureau Animal Industry.
Farmers' Bulletin 575
Farmers' Bulletin 713.
No. 88, Wyo. Exp. Sta.
No. 99, Wyo. Exp. Sta.
No. 113, Colo. Exp. Sta.
No. 211, Colo. Exp. Sta.
No. 86, Ida. Exp. Sta.

PERIODICALS.

American Journal of Veterinary Medicine.
American Sheep Breeder.
Breeder's Gazette.
National Wool Grower.
The Country Gentleman.

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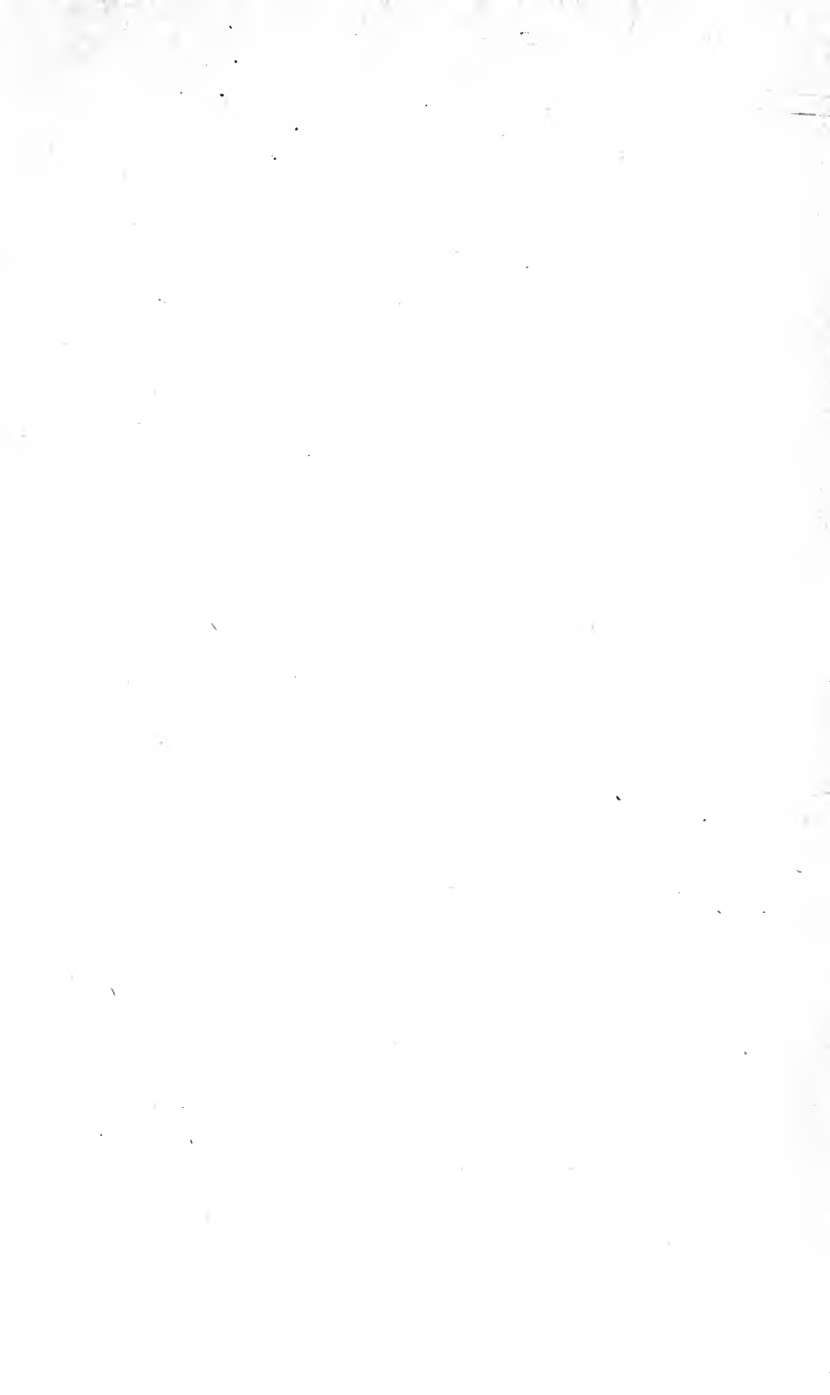
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